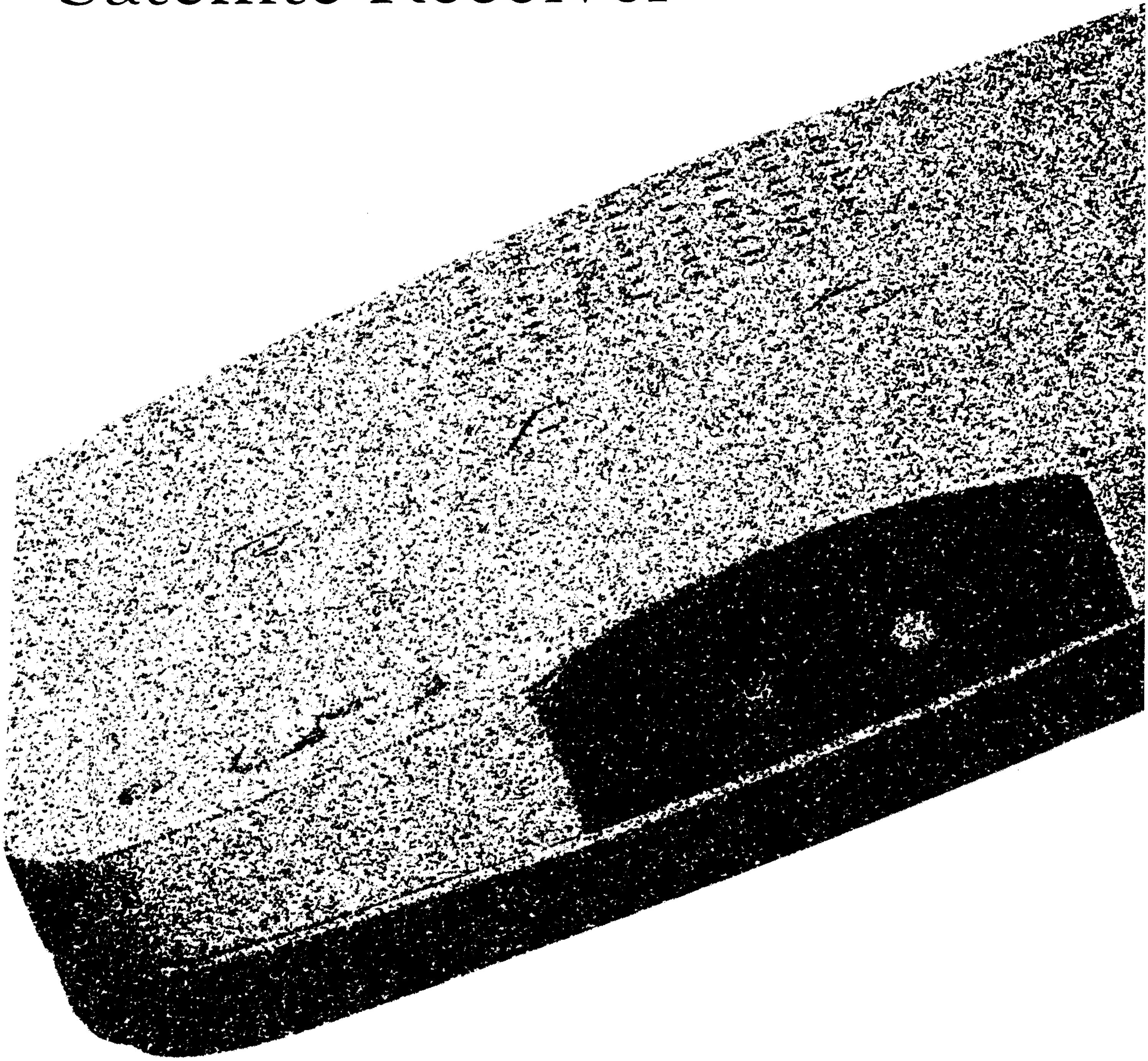
PACE - 00018

MSS100 SERIES
Satellite Receiver



Service Manual

PACE

18

THIS MANUAL COVERS THE FOLLOWING RECEIVERS:
MSS 100-I, MSS 138-G

PLEASE READ THE IMPORTANT NOTES ON PAGE 2.

CONTENTS

IMPORTANT NOTES 2

OUTLINE SPECIFICATION 4

- PIN DESIGNATIONS FOR SCART CONNECTORS 5

CONTROLS 6

MENU TREE 7

INSTALLATION 8

- UHF TUNING 8
- FORCING A PLAIN BACKGROUND FOR MENUS 9
- SETTING UP THE RECEIVER FOR THE ATTACHED DISH AND LNB(S) 9
  - Reaching the Input Menu 9
  - Changing the offset 10
  - Turning on/off power to the LNB 10
  - Setting the dish type 10
  - Setting the polariser type 10
  - Setting the LNB type 11
  - Setting the LNB band(s) 11
  - Changing the "Variable" setting 11
  - Saving your settings 11

DOWNLOADING 12

RESETTING THE PIN 12

WORKING WITH CHIP COMPONENTS 13

GAINING ACCESS TO THE UNIT 13

CIRCUIT DESCRIPTION 14

- MAIN BLOCK DIAGRAM 14
- TUNER AND VIDEO PROCESSING 14
- UHF MODULATOR 17
- SWITCH MODE POWER SUPPLY 19
- CONTROL CIRCUITRY AND DISPLAY 20
- DEMODULATION AND DE-EMPHASIS 21
- PERIFERAL COMPONENTS AND CONTROL LINES 21
- AUDIO BASEBAND AND SIGNAL ROUTING 21
- CIRCUIT DESCRIPTION (FOR RECEIVERS WITHOUT AN INTEGRAL DECODER) 24

FAULT FINDING 24

  - Checks on the Card Reader 31
  - Pin Numbering for Card Reader 31

GRID REFS - IDENT DIAGRAMS FOR MAIN PCB 32

GRID REFS - MAIN CIRCUIT (DIAGRAM ON SEPARATE SHEET) 34

SPARES - ELECTRICAL PARTS LIST FOR MAIN BOARD 35

SPARES - MECHANICAL PARTS LIST 40

DIFFERENCES BETWEEN THE IRD AND NON-IRD MODELS 40

  - Deleted components 40
  - Additional or changed components 40
  - Mechanical parts list - differences 40

POCKET FOR SEPARATE CIRCUIT DIAGRAMS AND VIDEOCRYPT INFORMATION 41

Important Notes

STATUS OF THE PRODUCT

The MSS 100 series of receivers have one main PCB which contains the majority of the components. Some units also have a small microprocessor extension PCB. The main PCB is currently at Revision A1. The PCB's part number is marked on the component side of the PCB. This number can be read on the component ident diagram in this manual, where revision A1 is denoted by the characters 101 at the end of the part number.

The parts lists and circuit diagrams in this manual include information from all Engineering Change Orders (ECOs) up to and including ECO S001016 and all Production Change Orders (PCOs) up to and including PCO S000458, provided that these ECOs and PCOs had an effectivity date on or before 28.06.95. Further changes will be given in technical bulletins.

If you need to find out the software version number of the receiver, you can display the Download Menu (see page 12) and then press the STORE key to display the second Download screen, which shows the software version number.

CIRCUIT DIAGRAMS

A sheet containing the main circuit diagram is in the pocket inside the rear cover of this manual.

VIDEOCRYPT CIRCUIT DESCRIPTIONS AND DIAGRAMS

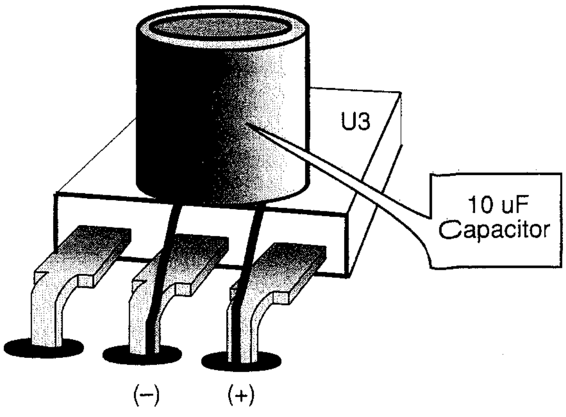
The MSS 100-I contains VideoCrypt circuitry. For copyright reasons, the circuit description and diagrams for this have been printed on special paper on a separate sheet, part of which has been overprinted with broad diagonal stripes to prevent photocopying. Each of these sheets has a unique, traceable serial number. As the card reader is intimately linked with the VideoCrypt circuitry, the description of the card reader circuitry is also given on this sheet, which can be found in the pocket at the rear of the manual.

HAND MODIFICATIONS

Hand modification to stabilise voltage regulators (ECO 001051)

Some 12 V voltage regulators oscillate in a hot ambient temperature. To alleviate this problem a 10 uF 5mm 20% 105c R/EL capacitor is fitted to U3 as shown in the diagram right.

10 uF 5mm 20% 105c R/EL CAP 5 x 11 855-1065751

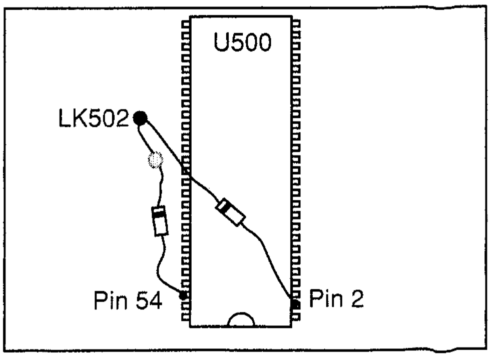


Hand modification to stop PANDA de-emphasis locking up (ECO 001048)

This modification prevents PANDA de-emphasis in U500 from locking up during power up.

A signal diode-BAT85/BAT 42 is added between pin 2 of U500 and LK502 (cathode). A second signal diode, BAT 85/BAT 42 is added between pin 54 of U500 and LK502 (cathode). Shown in the diagram right.

Signal diode-bat 85/bat 42 120-0008501



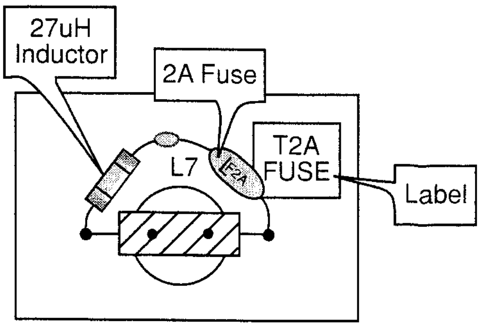
Hand modification to insert a 2 amp quick blow fuse (ECO 001048)

This modification ensures the receiver meets BEAB requirements.

A 27uH 10% Axial Inductor is attached to a 2A Axial antisurge fuse on L7, as shown in the diagram right.

The label "T2A fuse" is attached as shown in the diagram right.

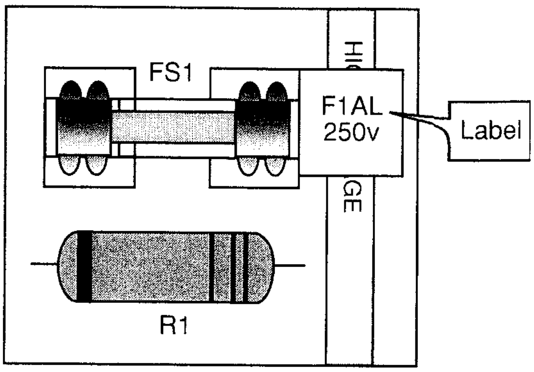
27uH 10% Axial Inductor 0805	130-0270601
Fuse-2A Axial antisurge	201-7410020
A Fuse Label T2A fuse MSS 100 PCB	299-1000210


27uH Inductor
2A Fuse
T2A FUSE
L7
F2A
Label

Hand modification to meet BEAB requirements (ECO 001048)

The label "F1AL/250v" is attached as shown in the diagram right.

A Fuse Label F1AL/250v MSS 100 PCB	299-1000200

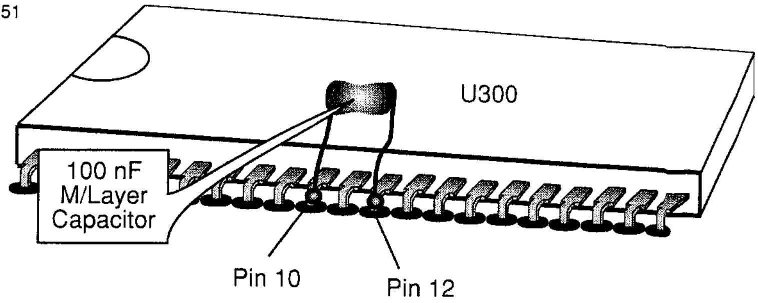

FS1
F1AL 250v
Label
R1
HI
GE

Hand modification to the VideoCrypt circuit (ECO 001059)

This modification adds a capacitor to decouple the bottom reference voltage.

A decoupling capacitor is added across pin 10 and pin 12 of U300 as shown in the diagram right.

100nF 50v 20% 5mm M/LAYER CAP TR	157-1045751

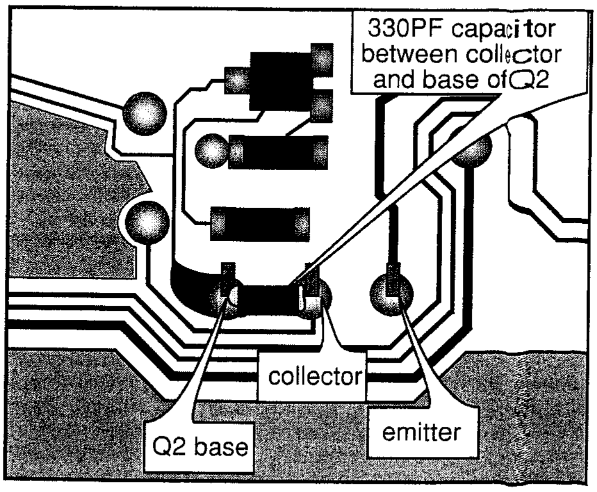

U300
100 nF M/Layer Capacitor
Pin 10
Pin 12

Hand modification to prevent oscillation of the LNB supply (ECO 001059)

This modification prevents the LNB supply from oscillating when set to the horizontal polarity, due to variations in the transistor gain bandwidth.

A capacitor is connected between the base and the collector of Q2 as shown in the diagram right.

330 pF 50v 10% CER CAP COG 0805 TR	950-3315601


330PF capacitor between collector and base ofQ2
collector
Q2 base
emitter

Outline Specification

GENERAL

Number of Programmes	250
Control buttons	Standby, Programme Up/Down buttons
UHF Modulator	CCIR PAL System I (System G in MSS 138-G), Ch. 21 to 69, preset to Ch. 38
Operating Voltage	180 – 240 V AC, 50 Hz
Power Consumption	18 W (max.) optional 10 W typical in low-power standby.
Dimensions	H = 75 mm, W = 260 mm, D = 260 mm approx.
Weight	1.9 kg (typical, when packed)

CONNECTORS

TV	SCART (RGB looped from decoder SCART only and CVBS)
VIDEO RECORDER	SCART (CVBS)
DECODER	SCART (Baseband Output, Audio/Video Input/Output, RGB in)
R & L (audio out)	Phono
MAINS INPUT	2-pin reversible
AERIAL	IEC female
TV	IEC male
LNB	Single F type (MSS100-I)/Dual F type(MSS138-G)

TUNER

Receiving Frequency Range	700 – 2150 MHz
Polarity Switching	Vertical: 12.0 – 14.0 V, Horizontal: 17.0 – 20.0 V at 0 – 400 mA with short circuit protection
LNB Tone Switching	Amplitude: 0.6 V ±0.2 V, Frequency: 22 kHz ±2 kHz
Input Impedance	75 Ω
I. F.	479.5 MHz
I. F. Bandwidth	27 MHz fixed (MSS100-I) 15 MHz/27 MHz software selectable (MSS138-G)
Input Level	–60 dBm to –30 dBm
Image Rejection	40 dB (typically)
Static Threshold	6 dB (typically)
Energy Dispersion Removal	35 dB (min.)

SCART CONNECTORS

Video Output Level	1 V p-p (±2 dB) into 75 Ω load.
Video Output Impedance	75 Ω
Video Frequency Range	50 Hz – 4.8 MHz (±3dB)
Video De-emphasis (PAL)	to CCIR 405.1 (625 lines)
Baseband Output Level	1 V p-p (±2 dB) into 75Ω load.
Baseband Frequency Range	30 Hz – 10.5 MHz (±3 dB) (Flat)
Baseband De-emphasis	PAL/Clamped/Flat, software selectable
Audio Frequency Range	30 Hz – 12 kHz
Audio Output Level	500 mV RMS into 10 k Ω

OPERATING/STORAGE CONDITIONS

Operating Temperature Range	5 – 40 °C
Storage Temperature Range	–20 – +50 °C

AUDIO

Audio Bandwidth	130, 180, 200, 280, 380, 500 or 600 kHz
Audio De-emphasis	PANDA 1, 50 µs, 75 µs or J17
Tuning Frequency Range	5.00 – 9.00 MHz in 10 kHz steps, left and right frequencies are independently tunable.
Modes	Mono 1 to 9 and Stereo A to D.

Due to continued product improvement, this specification is subject to change without prior notice.

➡

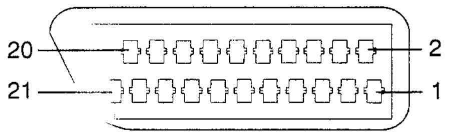
AUDIO

KU-Band preset audio modes

Mode	Frequency	De-emphasis	Bandwidth
Stereo A	7.02 & 7.20 MHz	PANDA 1	130 kHz
Stereo B	7.38 & 7.56 MHz	PANDA 1	130 kHz
Stereo C	7.74 & 7.92 MHz	PANDA 1	130 kHz
Stereo D	8.10 & 8.28 MHz	PANDA 1	130 kHz
Mono 1	6.50 MHz	50 µs	200 kHz
Mono 2	7.02 MHz	PANDA 1	130 kHz
Mono 3	7.20 MHz	PANDA 1	130 kHz
Mono 4	7.38 MHz	PANDA 1	130 kHz
Mono 5	7.56 MHz	PANDA 1	130 kHz
Mono 6	7.74 MHz	PANDA 1	130 kHz
Mono 7	7.92 MHz	PANDA 1	130 kHz
Mono 8	8.10 MHz	PANDA 1	130 kHz
Mono 9	8.28 MHz	PANDA 1	130 kHz

PIN DESIGNATIONS FOR SCART CONNECTORS

Socket Viewed from Rear Panel



Pin	TV SCART	Pin	VCR SCART	Pin	DECODER SCART
1	R Audio Out	1	R Audio Out	1	R Audio Out
2	Not connected	2	R Audio In	2	R Audio In
3	L Audio Out	3	L Audio Out	3	L Audio Out
4	Audio Ground	4	Audio Ground	4	Audio Ground
5	Blue Ground	5	Ground	5	Blue Ground
6	Not connected	6	L Audio In	6	L Audio In
7	Blue Out	7	Not connected	7	Blue In
8	AV Status Out	8	VCR Status In	8	Ext. Decoder Status In
9	Green Ground	9	Ground	9	Green Ground
10	Not connected	10	Serial Data I/O port	10	Not connected
11	Green Out	11	Not connected	11	Green In
12	Not connected	12	Serial Data I/O port	12	Serial Data I/O Port
13	Red Ground	13	Ground	13	Red Ground
14	Ground	14	Ground	14	Ground
15	Red Out	15	Not connected	15	Red In
16	RGB Status Out	16	Not connected	16	RGB Status In
17	Video Ground	17	Video Ground	17	Video Ground
18	Ground	18	Ground	18	Ground
19	Video Out	19	Video Out	19	Baseband Video Out
20	Not connected	20	Video In	20	Video In
21	Ground (Casing)	21	Ground (Casing)	21	Ground (Casing)

Controls

HANDSET OVERVIEW

TV/SAT	To switch between satellite TV, terrestrial TV or your video recorder (if your receiver, TV and video recorder are connected by SCART leads).
AV ⓿	To select an external audio/ video (AV) source.
▲ RCL	To recall the last programme. To select menu options (move within a menu).
◀ ▶	To step through programmes in normal viewing mode; to change values in menus.
i	To display programme information.
STORE	To store changes and leave menu to return to a satellite programme.
NORM	To leave menu without storing changes and return to a satellite programme.
SHAPE LEVEL DD EFFECT	These keys have no function.

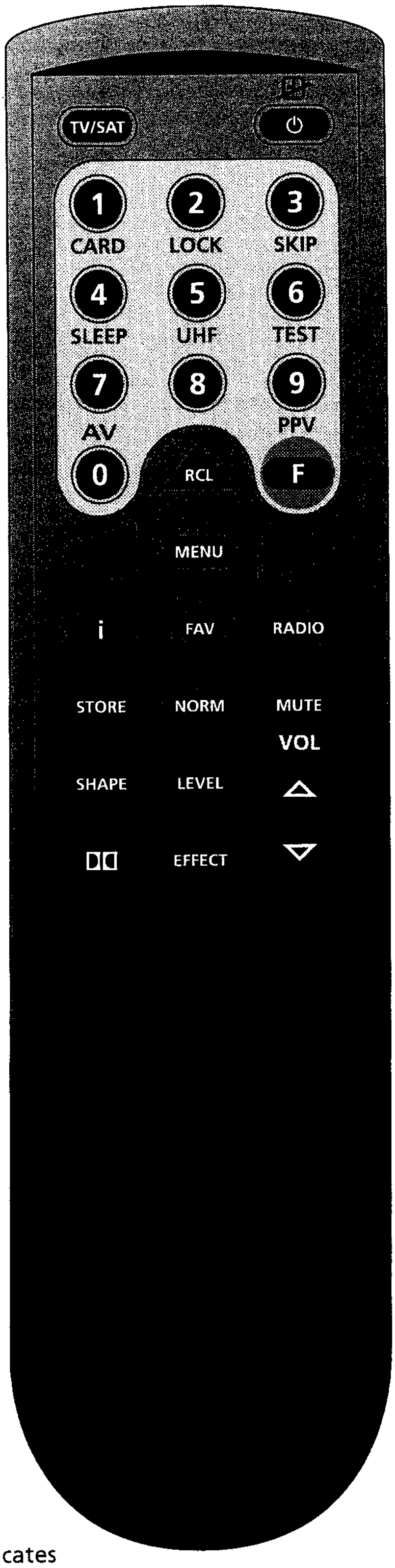
The handset operates the receiver using a series of lists (menus). Each menu comprises a range of numbered options, grouped according to the job they perform.
When an operation is described in this manual, it is often given pictorially and as a written instruction, as shown below which means: On your satellite receiver handset, press the MENU key, then press the 5 key, then press the 2 key.

Press MENU, 5, 2

or

MENU ❺ ❷ →

The arrow (→) indicates the result of your actions.



⏻	To put the receiver into or take it out of standby.
⓿ to ❾	Number keys. To select programmes; to move between menus (sometimes to change menu values).
F	F (function) key – used with the other keys to give "short-cut" methods for certain functions (e.g. LOCK). "☛ F " is displayed on screen when you press this key (indicating that another key must be pressed for the shortcut to work).
MENU	To display the Main Menu on screen; to move back up the menus to previous menus.
RADIO	To select satellite radio programmes.
▼ FAV	To select favourite categories. To select menu options (move within a menu).
MUTE	To mute the sound.
VOL △ ▽	Volume (rocker) key (shown in the manual as VOL △ or VOL ▽.

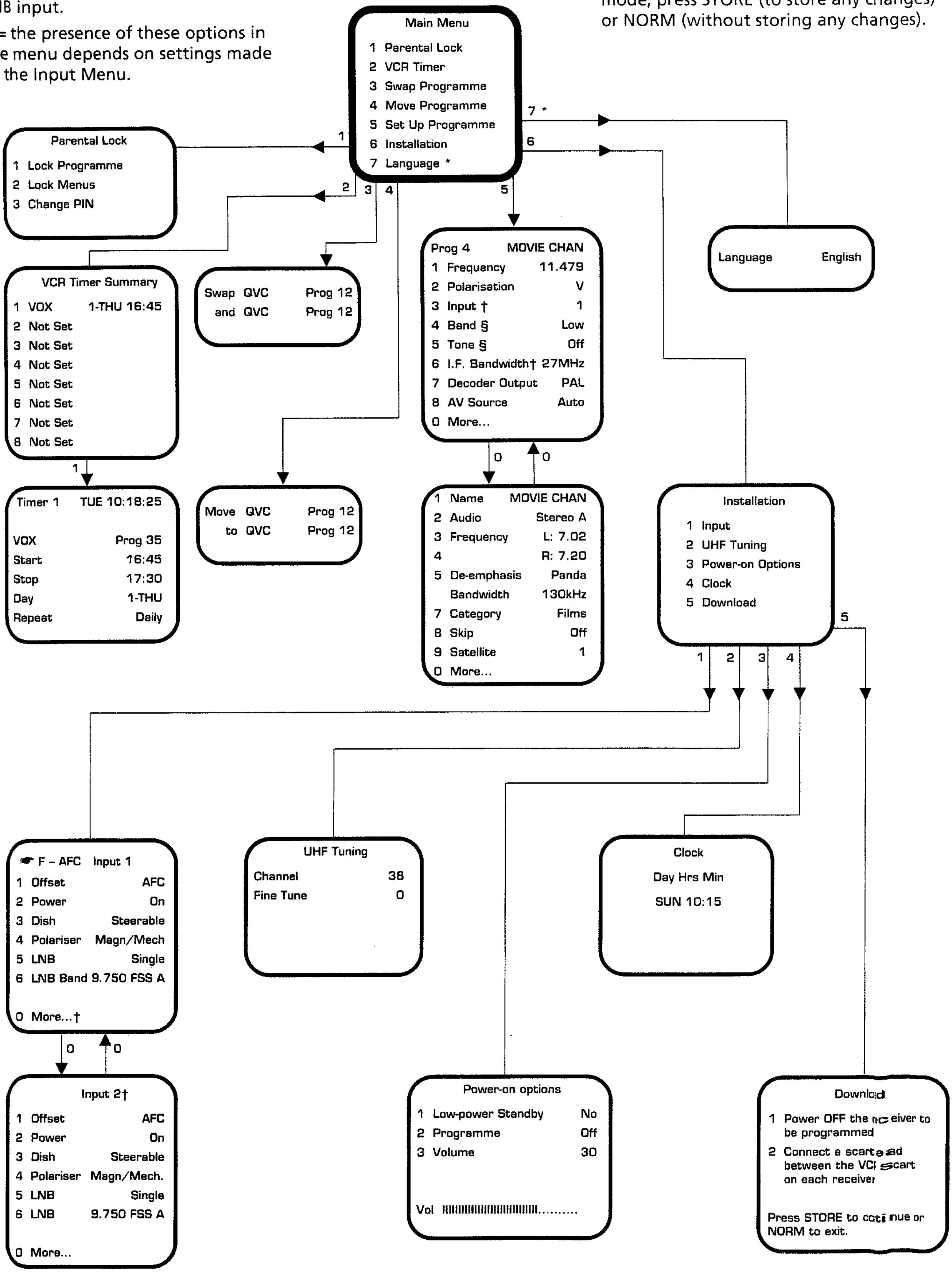
Menu Tree

* = absent for receivers with integral VideoCrypt decoder.

† = absent for receivers with a single LNB input.

§ = the presence of these options in the menu depends on settings made at the Input Menu.

Use the number keys to move down the menu tree and the MENU key to move back up it. To return to normal viewing mode, press STORE (to store any changes) or NORM (without storing any changes).


Main Menu
1 Parental Lock
2 VCR Timer
3 Swap Programme
4 Move Programme
5 Set Up Programme
6 Installation
7 Language *
1
2
3
4
5
6
7 *
Parental Lock
1 Lock Programme
2 Lock Menus
3 Change PIN
VCR Timer Summary
1 VOX 1-THU 16:45
2 Not Set
3 Not Set
4 Not Set
5 Not Set
6 Not Set
7 Not Set
8 Not Set
1
Timer 1 TUE 10:18:25
VOX Prog 35
Start 16:45
Stop 17:30
Day 1-THU
Repeat Daily
Swap QVC Prog 12
and QVC Prog 12
Move QVC Prog 12
to QVC Prog 12
Prog 4 MOVIE CHAN
1 Frequency 11.479
2 Polarisation V
3 Input † 1
4 Band § Low
5 Tone § Off
6 I.F. Bandwidth† 27MHz
7 Decoder Output PAL
8 AV Source Auto
0 More...
0
0
1 Name MOVIE CHAN
2 Audio Stereo A
3 Frequency L: 7.02
4 R: 7.20
5 De-emphasis Panda
Bandwidth 130kHz
7 Category Films
8 Skip Off
9 Satellite 1
0 More...
Language English
Installation
1 Input
2 UHF Tuning
3 Power-on Options
4 Clock
5 Download
1
2
3
4
5
☛ F - AFC Input 1
1 Offset AFC
2 Power On
3 Dish Steerable
4 Polariser Magn/Mech
5 LNB Single
6 LNB Band 9.750 FSS A
0 More...†
0
0
Input 2†
1 Offset AFC
2 Power On
3 Dish Steerable
4 Polariser Magn/Mech.
5 LNB Single
6 LNB 9.750 FSS A
0 More...
UHF Tuning
Channel 38
Fine Tune 0
Clock
Day Hrs Min
SUN 10:15
Power-on options
1 Low-power Standby No
2 Programme Off
3 Volume 30
Vol IIIIIIIIIIIIIIIIIIIIIIIIIIII..........
Download
1 Power OFF the receiver to be programmed
2 Connect a scart lead between the VCR scart on each receiver
Press STORE to continue or NORM to exit.

Installation

UHF TUNING

Note

You can ignore this section if the satellite receiver and TV (and video recorder) are connected by SCART leads.

If the satellite receiver is connected to the TV (and video recorder) by coaxial leads then you must perform UHF tuning.

Notes

You may connect the satellite receiver by both SCART and coaxial leads. As long as SCART leads have been used to connect your satellite receiver, TV **and** video recorder you do not need to perform UHF tuning.

It is important that the UHF channel chosen for satellite TV is not used for the video recorder and is free of any other broadcasting.

Tuning the TV (and video recorder) to the satellite receiver

The satellite receiver has been factory set to UHF channel 38 (UHF frequency 607.25 MHz). To tune the TV to this channel proceed as follows:

›› Press the number key(s) on the TV handset that you want to use for satellite TV.

›› On the satellite receiver handset press F, 5.

The red light on the front panel of the satellite receiver should flash.

If the TV channel chosen corresponds to UHF channel 38 then you will see the satellite receiver UHF Tuning Menu on screen. If you do not see this menu then you must tune the TV in accordance with the manufacturer's instructions until a good quality picture of the UHF Tuning Menu is visible.

›› Press NORM to renove the UHF Tuning Menu from the screen.

›› You should now see a satellite TV programme.

›› Set your video recorder to the same UHF channel.

Tuning your satellite receiver to a UHF channel

›› Select the number key(s) on your handset that you want to use for satellite TV.

›› Set the UHF channel for this handset key to one that is free of any other broadcasts, for example UHF channel 46.

›› Press F, 5 on the satellite receiver handset.

The receiver's UHF Tuning Menu is now selected (although you cannot see it yet). The red light on the front panel should flash.

›› Press the two number keys on the satellite receiver handset that correspond to the chosen UHF channel number, in this example 4, 6.

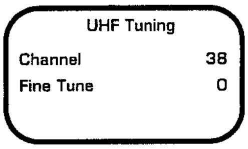
You should see the UHF Tuning Menu on the TV screen.

›› Press STORE to save this setting.

›› Set the video recorder to the same UHF channel.

Note

If having completed the tuning, you see a UHF Tuning Menu but no picture, check the Band setting at the Set Up Programme Menu.



UHF Tuning

Channel 38

Fine Tune 0

Fine tuning

To get the sharpest picture, you may wish to fine tune at the UHF Tuning Menu.

›› Press ▲ or ▼ to select the Fine Tune option.

›› Press ◄ or ► to get the sharpest picture.

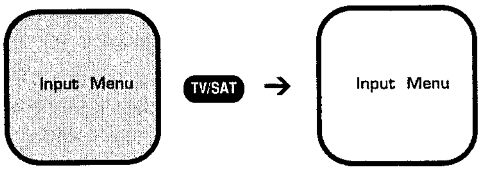
›› Press STORE.

You can fine tune between -3 and +4. If you press ► at +4, the channel increases by one and Fine Tune becomes -3.

FORCING A PLAIN BACKGROUND FOR MENUS

Sometimes, when there is a scrambled or distorted picture on the screen, a menu may be difficult to read. Force a plain background as follows:

- ›› Press TV/SAT.
- ›› Press TV/SAT again to remove the plain background.



distorted background

plain coloured background

SETTING UP THE RECEIVER FOR THE ATTACHED DISH AND LNB(S)

Reaching the Input Menu

›› To display the Input Menu press MENU, 6, 1.

The Input Menu should appear superimposed on the satellite programme. It could be that until you adjust certain settings at this menu, the background picture remains very distorted, making the text difficult to read. If this is the case, you can press the TV/SAT key on your handset to force a plain background for the menu.

Note

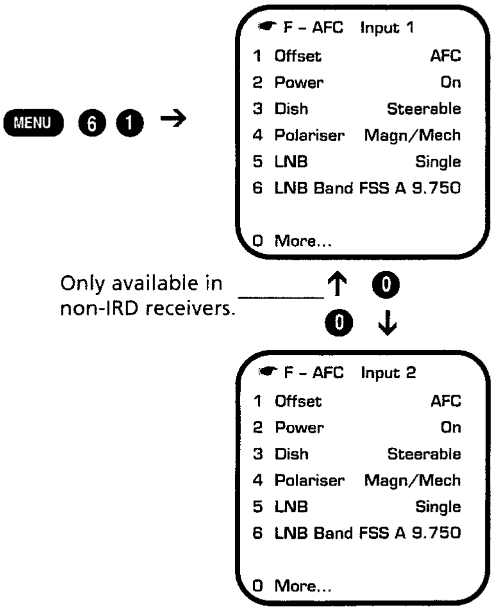
In a non-IRD receiver, display the Input 2 Menu, by pressing 0 at the Input 1 Menu.

Important – the LNB Band.

Before using the receiver it is **very** important to check that the "LNB Band" option (or "Low Band" and "High Band" options) at the relevant Input Menu is set to correspond with the LNB on the dish attached to that input. If it is not, then there can be problems (see below).

The LNB type for Input 1 (and Input 2 in non-IRD receivers) is preset at the factory as 9.750 FSS A (preset for LNBs with a local oscillator whose frequency is 9.750 GHz).

The following information assumes that your dish antenna and LNB have been installed and that the lead from the LNB is connected to Input 1 of your receiver.



F - AFC Input 1
1 Offset AFC
2 Power On
3 Dish Steerable
4 Polariser Magn/Mech
5 LNB Single
6 LNB Band FSS A 9.750
0 More...

Only available in non-IRD receivers.

F - AFC Input 2
1 Offset AFC
2 Power On
3 Dish Steerable
4 Polariser Magn/Mech
5 LNB Single
6 LNB Band FSS A 9.750
0 More...

What can happen if an LNB is set incorrectly

If an LNB setting does not correspond with the attached LNB, there can be problems.

If you set "FSS B" at the Input Menu and the LNB is not suitable for "FSS B" (or, conversely, you have attached an "FSS B" LNB, but set a different value at the menu) then the receiver tunes to a different frequency, so that you see a different programme or no programme at all.

In other cases the receiver does not tune into a different frequency (i.e. the same programme remains on the screen) but the frequency displayed at the **Set Up Programme Menu** may not be correct.

If you are attaching this receiver to an existing satellite dish

You can check if it is set correctly as follows:

- ›› Look at the programme list and key in the programme number that corresponds to Sky News (frequency: 11.377 GHz); the programme Sky News should be visible.
- ›› If you see CNN on the screen, display the Input Menu and change the LNB Band option from FSS A 9.750 to FSS B 10.000 – see page 20.
- ›› If you see GALAVISION, display the Input Menu and change the LNB Band option from FSS B 10.000 to FSS A 9.750 – see page 20.

Changing the offset

You cannot adjust the offset until you have pointed the dish at the satellite and can see some programmes.

The receiver has been factory-preset for automatic offset (AFC). For a fixed dish, AFC should give a good picture with few or no speckles. You should not need to alter this unless you are trying to receive a very weak signal with a speckled picture.

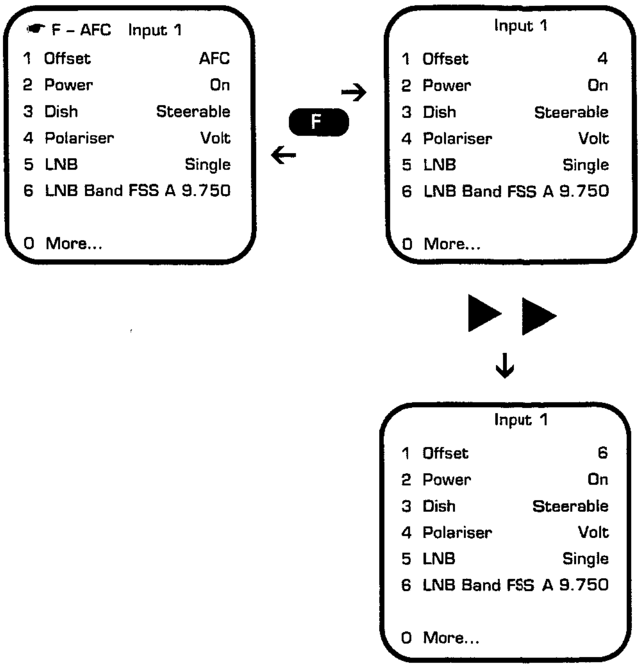
For a steerable dish, we recommend that you switch off AFC.

›› Press F to switch off the AFC.

›› Press ◀ or ▶ to set the offset manually between –15 and +15 to give the best picture, with an even mix of black and white speckles.

›› Press STORE to save.

›› If a non-IRD receiver also has a dish connected to Input 2, select a programme being received at Input 2. Display the Input 2 Menu and change the offset as described above.



☛ F - AFC Input 1
1 Offset AFC
2 Power On
3 Dish Steerable
4 Polariser Volt
5 LNB Single
6 LNB Band FSS A 9.750
0 More...

Input 1
1 Offset 4
2 Power On
3 Dish Steerable
4 Polariser Volt
5 LNB Single
6 LNB Band FSS A 9.750
0 More...

Input 1
1 Offset 6
2 Power On
3 Dish Steerable
4 Polariser Volt
5 LNB Single
6 LNB Band FSS A 9.750
0 More...

Turning on/off the power to the LNB

The receiver should provide power to the LNB except in certain communal dish installations (in which case the LNB must not receive power from the receiver). If you are connecting your receiver to a communal dish installation, consult the installer for advice on which setting you should choose.

Setting	What is powered
Off	LNB never powered from the receiver
On	power to the LNB from the receiver (if "On" is set at both Input Menus, power goes only to the LNB which is receiving the current programme).

Setting the dish type

The Dish option allows you to inform the receiver that you have connected a steerable dish or a fixed dish.

›› Press ◀ or ▶ to set "Steerable" or "Fixed" as appropriate.

When "Steerable" is selected, the Polariser option appears in the Input Menu.

Setting the polariser type

If you have **not** attached a dish positioner to the receiver, or have attached a positioner that **does not** contain polariser control circuitry, the factory setting of "Volt" is correct. Do not change this setting.

If you have attached a dish positioner that contains polariser control circuitry, you must change the setting at the Polariser option.

›› Press ◀ or ▶ to set Magn/Mech.

If you change the Polariser option you must check that the LNB option has the correct setting.

LNBs that have an electromagnetic or mechanical polariser, are an advantage for steerable dishes as they allow you to make adjustments to give the best picture for each programme.

Setting the LNB type

The LNB option must be set to correspond with the type of LNB on your dish.

» Press ◄ or ► to set the required value (see table right).

If Multi Band or Universal is selected, the next option in the menu ("LNB Band") changes to become two options, Low Band and High Band.

You must then set the "LNB Band" or "Low Band" and "High Band" options to correspond with the LNB (see below).

Notes

If "Multi Band Tone" or "Universal" is set then the "Tone" option disappears from the Set Up Programme Menu.

If "Multi Band Tone", "Multi Band Volt" or "Universal" is selected ,then a "Band" option appears in the Set Up Programme Menu.

Setting the LNB Band(s)

» For a single-band LNB, press ◄ or ► to select one of the LNB bands shown right or choose the setting "Variable" (see below).

The numbers in the LNB Band names are the frequencies (in GHz) of the LNB's local oscillator. The second column shows the frequency range over which you **should** tune at the Set Up Programme Menu. We do not recommend that you tune outside these ranges, as performance cannot then be guaranteed.

» For a multi-band LNB, select the Low Band and High Band options in turn and press ◄ or ► to set the correct value for each band. The following options are available:

Low Band	FSS A 9.750/ FSS B 10.000/ C-Band 5.150
High Band	DBS 10.750/T-COM 11.475/ C-Band 5.150 /Var.

Note

If the LNB option is set to Universal, you cannot change the Low Band and High Band settings.

Changing the "Variable" setting

» Select "Var." (the number next to it flashes). Use the number keys to key in the LNB's local oscillator frequency (in the range 9.050 to 13.000 GHz).

Saving your settings

You do not need to press STORE after changing each setting. Instead make all the changes you desire at the menu, then press STORE to save all the settings.

Setting	Usage
Single	If the LNB is single-band.
Universal	If the dish has a universal LNB. This is a specific type of multi-band tone-switching LNB with specific band settings (see table below) and a voltage-switching polariser.
Multi Band Tone	If the LNB is multi-band and uses a tone to switch between bands.
Multi Band Volt	If the LNB is multi-band and uses voltage to switch between bands.

LNB Band	Freq. Range(GHz)	Typical Satellites
FSS A 9.750	10.700 - 11.800	Astra 1A, 1B, 1C, 1D/ Intelsat/ Eutelsat
FSS B 10.000	10.920 - 11.700	Astra 1A, 1B, 1C/ Intelsat/ Eutelsat
DBS 10.750	11.700 - 12.500	TDF/ TV-Sat/ Hispasat
T-COM 11.475	12.500 - 12.750	Telecom 2A, 2B, 1C
C-Band 5.150	3.700 - 4.200	Asiasat
BSS 10.600	11.700 - 12.500	Astra

DOWNLOADING

You use this feature to "program" another receiver of the same type. During the download, all of the information stored in the first receiver's internal memory is transferred to the second receiver. This includes all the settings which you have made and stored at the menus, except the clock setting and any timers you have set up.

Note

When downloading, you must follow the on-screen instructions exactly, otherwise errors may occur.

With a satellite TV picture displayed from the receiver you are downloading **from**:

›› At the receiver you are downloading **from**, press MENU, 6, 5, to display the Download Menu.

›› Turn off the power to the receiver you want to download **to**.

›› Connect a SCART lead between the VCR SCART connector on the rear panel of each receiver.

›› Press STORE.

Note

The number on the screen is the software version number.

›› Turn on the power to the receiver you want to download **to**.

Note

Up to this stage, you can stop the download by pressing the NORM key. If you continue beyond this step, you cannot stop the download.

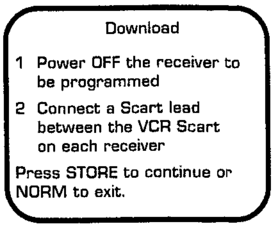
›› Press STORE.

During download "global" information is transferred first, then all the programme information. Messages appear on the screen to tell you which programme is currently being transferred. Download takes about 15 seconds.

›› When the message "Download Complete" appears, disconnect the receiver you have downloaded **to**. Press STORE to return to the Installation Menu if you wish to download to another receiver, otherwise press NORM to return to a satellite programme.

If the download fails for any reason, the message "Download Error" appears.

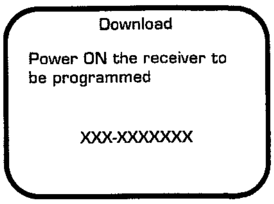
MENU 6 5 →


Download

1 Power OFF the receiver to be programmed

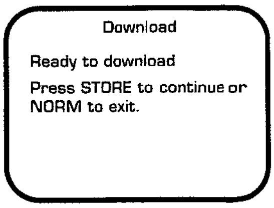
2 Connect a Scart lead between the VCR Scart on each receiver

Press STORE to continue or NORM to exit.


Download

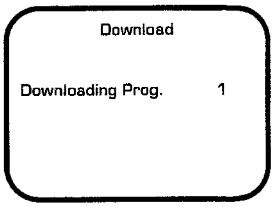
Power ON the receiver to be programmed

XXX-XXXXXXX

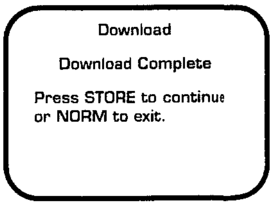

Download

Ready to download

Press STORE to continue or NORM to exit.


Download

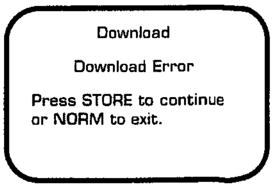
Downloading Prog. 1


Download

Download Complete

Press STORE to continue or NORM to exit.

or


Download

Download Error

Press STORE to continue or NORM to exit.

RESETTING THE PIN

The factory-set PIN is 1234.

If you have a PIN and do not know what it is, you can reset the PIN to its factory value as follows:

At the wall socket, disconnect the receiver from the mains supply. Hold down the ⏻ button **on the top cover** while you reconnect the receiver at the wall socket. You need to hold down the ⏻ button for several seconds.

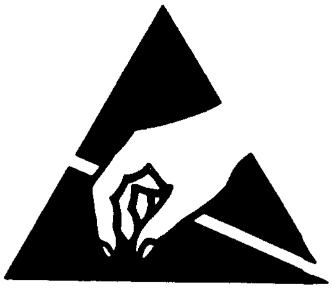
When the PIN is reset, the following also occur: any locked programmes or menus become unlocked and the clock and any timers set up are no longer set.

Working with Chip Components

ELECTROSTATIC SENSITIVE (ES) DEVICES

Many semiconductor devices, such as integrated circuits and field effect transistors, can easily be damaged by static electricity. The following precautions should be observed when ES devices are being handled.

- Always use a grounded tip soldering iron and anti-static type solder removal devices.
- Before handling a device, discharge any electrostatic charge on your body by touching a known earth point - preferably use an earthed bench mat or ground mat together with a wrist strap.
- Do not remove an ES device from its protective packing until you are ready to fit it. Touch the protective material to the chassis or the assembly in which the ES device is to be installed, before removing the device from its packing.



GENERAL PRECAUTIONS WHEN HANDLING CHIPS

Do not handle chips with your bare hands as this causes oxidation on the chip's terminals which leads to poor soldering.

Do not store the chips in any of the following , as oxidation occur s and capacitance and resistance are affected i.e. areas with sulphur or chlorine gas; direct sunlight and areas of high temperature and/or high humidity.

Rough handling of circuit boards containing surface mount devices can cause damage to the components and the board; never bend or flex boards.

Do not heat or cool the boards unnecessarily, as the board materials expand and contract by differing amounts which can cause the components and solder connections to be stressed.

Never rub or scrape chip components as this can change their value. Do not slide the board across any surface.

When using a soldering iron, take care and apply suitable pressure.

For preference, use a soldering iron rated at approx. 30 W with a thermostatic control to give soldering temperatures of approx. 225 to 250 °C.

Do not re-use any chips removed from the board.

When attaching chips, solder as quickly as possible so as not to damage the terminals and body of the chip. Do not touch the terminals directly with the soldering iron.

While soldering, keep the chip's body in contact with the board.

Attaching a Chip

Place the chip in the correct position and temporarily solder one terminal to the copper surface.

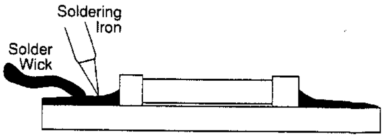
Holding the chip body with a pair of tweezers to position it accurately, complete the soldering at each terminal in turn.

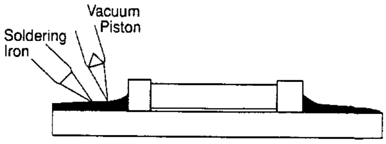
Removing a Chip

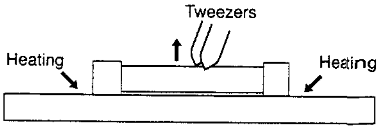
Heat the solder for 2 to 3 seconds at each terminal of the chip. Remove the molten solder with solder wick.

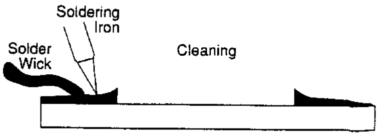
Holding the chip with a pair of tweezers, remove it gently from the board while the solder at each terminal is molten.

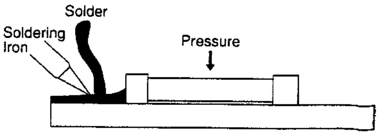
Wick off all excess solder from the board, so that it is ready for new components.

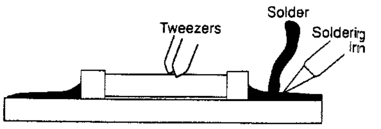


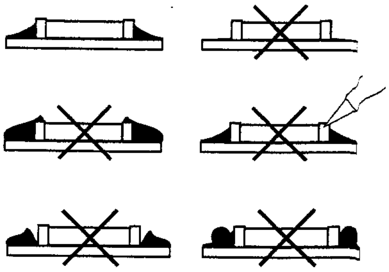












Circuit Description

The receiver consists of a single main PCB. Circuit diagrams are in the pocket on the rear cover. Some receivers may have an extension board in place of the main microprocessor U700 (see page 20).

The adjacent "main" block diagram shows the main functional blocks. For copyright reasons, the VideoCrypt functions are given on a separate sheet. (See the pocket on the rear cover.) The following description is for receivers with an integral VideoCrypt decoder. Most of this also applies to non-VideoCrypt receivers; The differences are indicated on page 24.

TUNER AND VIDEO PROCESSING

Tuner

When a programme is selected via the handset, data received by the sensor IR 700 is fed, as TTL level data, to the microprocessor U700. In turn U700 supplies tuning data to a frequency synthesiser U100. The synthesiser forms the reference oscillator for the phase locked loop which controls the local oscillator in the tuner. The prescaler output of the tuner is obtained by dividing the local oscillator frequency by 128.

The local oscillator is set 479.5 MHz higher in frequency than the chosen programme and is mixed with the incoming signal. The signal is then amplified by an IF stage centred at 479.5 MHz with a bandwidth of 27 MHz. The 479.5 MHz FM signal is then demodulated in the tuner to give the required composite video baseband signal (CVBS) output.

The frequency synthesis is performed by U100 which receives divider ratio data for the required programme via the 3-wire serial bus from the microprocessor U700. The data is on pin 5, clock on pin 4 and select on pin 3 of U100. The synthesiser generates a reference frequency from the 5.625 MHz crystal (X100) input on pins 1 and 2. The prescaler input on pin 11 of U100 is divided down according to the divider ratio sent from U700 and compared with the generated reference (see also the diagram on page 20). The error signal from the phase locked loop (pulses on pin 14 of U100) is integrated by Q100 and associated components. These determine how much of the 30 V supply appears as the tuner control voltage on pin 15 of the tuner. The 5V supply to the tuner is on pin 12.

To compensate for the LNB's local oscillator frequency conversion offsets, information on the position of the signal relative to the 27 MHz bandpass filter within the tuner passes from pin 10 of TUNER100 to pin 35 of U700. The frequency synthesised within U100 is then varied under control from U700. This automatic frequency control (AFC) keeps the signal central in the 27 MHz bandpass filter.

In dual-input models of the receiver, the Tuning Menu can be used to specify whether a programme is received via LNB 1 or LNB 2. The line LNB_SELECT controls both the supply and select for the LNBs and comes from pin 21 of U700. Pin 4 of the tuner is the select line for LNB1 and it is enabled by Q106; pin 6 is the select line for LNB 2 and it is enabled by Q107. Power to the LNBs passes through the tuner via pin 3 for LNB 1 and pin 5 for LNB 2. There are further details about the LNB supply in the SMPS circuit description on page 19.

The baseband signal from pin 13 of the tuner is low pass filtered by R110, C112, C113 and L100. It is then buffered by emitter follower Q101 and AC coupled into the video input pin (pin 20) of the sound and video processor and switch matrix (U500) by C548. The baseband signal from U101 emitter is also high pass filtered by C556, C555, C549, R539, R538 and L503 to filter out the video, and the resulting audio subcarriers are input to the FM input (pin 23) of the sound and video processor (U500).

Dual Bandwidth Tuner

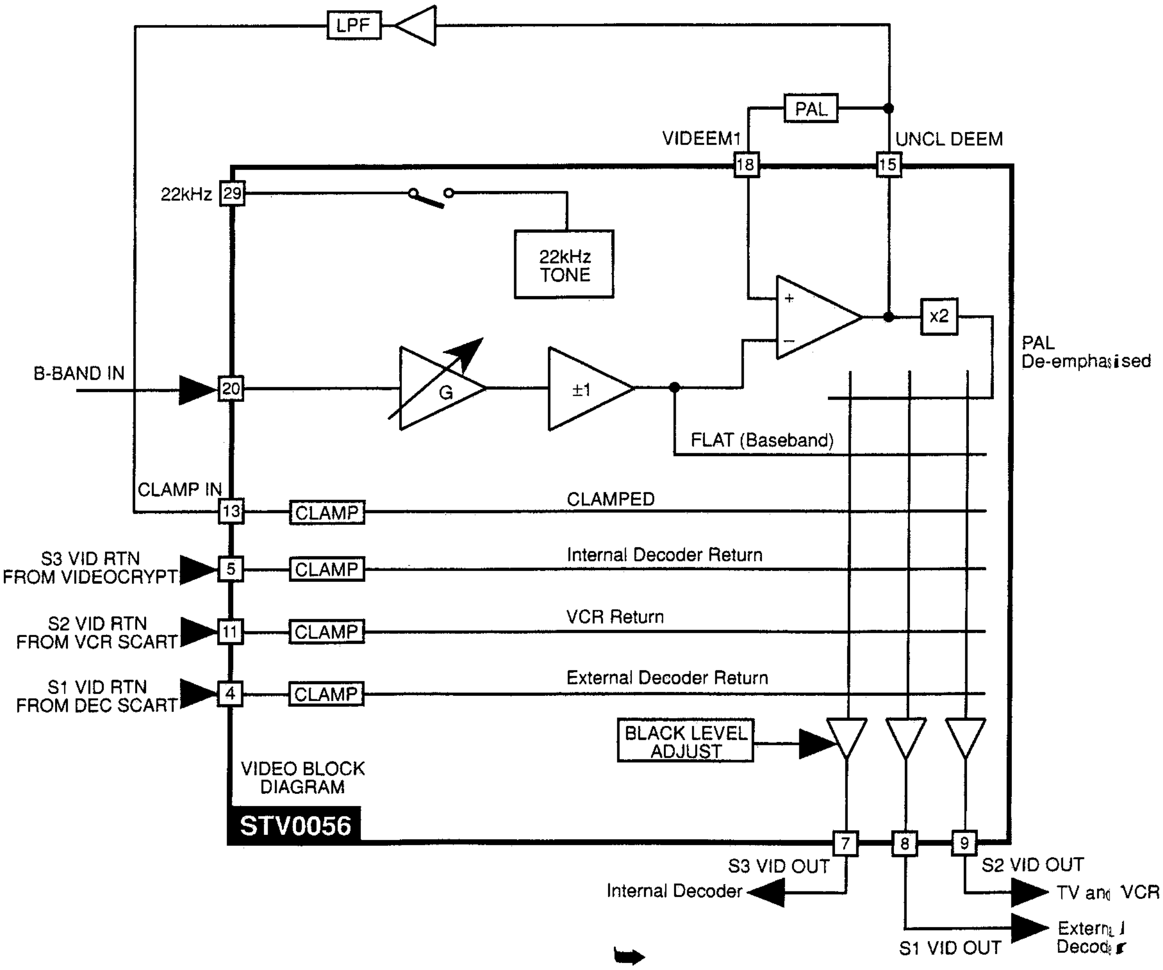
The bandwidth of the tuner is controlled by the BANDWIDTH control line which comes from pin 14 of the modulator chip U200. This pin is an open collector output and must have the pull up resistor R112 fitted to function properly. U200 is under the control of the microprocessor U700 via the I²C bus.

For an 18/27 MHz tuner the video gain of the receiver is the same at both bandwidths. For a 27/36 MHz tuner the video gain must be reduced when 36 MHz is set at the Set Up Programme Menu. This is because the video level from the tuner will be larger for the 36 MHz bandwidth due to the deviation being 22 MHz/volt instead of 16 MHz/volt for the 27 MHz bandwidth. The gain reduction is achieved by the variable gain amplifier inside U500 and is done automatically by the software when the appropriate selection is made.

Video processing within U500

The baseband enters U500 at pin 20 where it enters a variable gain video amplifier whose output can be selected to be normal or inverted (for C-Band video). This signal is also further processed in U500 by a second amplifier and the network connected between pins 15 and 18 to perform the PAL de-emphasis. The output of this amplifier provides an input to the onboard 6 x 3 video switch which is called FLAT (since it has no de-emphasis). The output of the second amplifier also provides an input to the video switch matrix which is called PAL (since it is PAL de-emphasised). This signal also exits U500 at pin 15 and is filtered by L501, L502 and associated components. This then passes through a sound trap comprising L500 and associated components (if fitted) before undergoing group delay compensation by Q500, Q501 and associated components. The signal then re-enters U500 at pin 13 where the energy dispersal is removed by a sync. tip clamping circuit. Most satellite signals are transmitted with energy dispersal to distribute the energy more evenly across the transmission bandwidth. Energy dispersal is a triangular 25 Hz waveform added to the signal. If it is not removed, flickering can occur on the screen. The signal on pin 13 provides an input to the switch matrix which is called CLAMPED. The three other inputs to the switch matrix (U500) are INTERNAL DECODER RETURN, VCR RETURN and EXTERNAL DECODER RETURN.

The decoder SCART video options are limited to PAL, FLAT or CLAMPED in the Set Up Programme Menu.


LPF
PAL
VIDEEM1
UNCL DEEM
18
15
22kHz
29
22kHz TONE
+
−
x2
PAL De-emphasised
B-BAND IN
20
G
±1
FLAT (Baseband)
CLAMP IN
13
CLAMP
CLAMPED
S3 VID RTN FROM VIDEOCRYPT
5
CLAMP
Internal Decoder Return
S2 VID RTN FROM VCR SCART
11
CLAMP
VCR Return
S1 VID RTN FROM DEC SCART
4
CLAMP
External Decoder Return
BLACK LEVEL ADJUST
VIDEO BLOCK DIAGRAM
STV0056
7
8
9
S3 VID OUT
Internal Decoder
S2 VID OUT
TV and VCR
External Decoder
S1 VID OUT

The VCR SCART video will be CLAMPED, INTERNAL DECODER RETURN or EXTERNAL DECODER RETURN depending upon the status of VC_ACTIVE and DEC_PIN_8.

The TV SCART will switch between CLAMPED, INTERNAL DECODER RETURN, VCR RETURN and EXTERNAL DECODER RETURN depending on the status of VC_ACTIVE, VCR_PIN_8 and DEC_PIN_8.

Colour Graphics Generator

The video signal at pin 9 of U500 is already clamped at the correct level for the graphics chip and so no buffer is required. R601 and D600 limit the amplitude of the video to less than 5 V, as with noisy signals the video amplitude could exceed 5 V and break through the blue screen menus.

U600 and associated components form the graphics generator which is used to generate the menu background colour and on-screen text characters, under control from the microprocessor U700. The background colour is fixed to blue. There are two graphics modes: plain background and superimposed on a programme.

There are two oscillators associated with U600. The first oscillator is the crystal X600 which generates a frequency of 17.734 MHz. This is exactly four times the frequency of the colour information which is used to generate the background colour and is therefore relevant to plain background mode. If this frequency is not within a few hundred hertz of 17.734 MHz, there may be no colour to the on-screen graphics display (it depends on the tolerance of the TV set). The second oscillator is within U600 and it runs at approximately 7 MHz, its frequency being set by external components L602, C609 and C610. This is used, together with horizontal and vertical sync. pulses, to generate the characters and their positions on the screen. For the superimposed on picture mode the horizontal and vertical sync. pulses enter U600 at pins 18 and 19 respectively. For plain background mode the horizontal and vertical sync. pulses are generated within U600. For both these modes, the white level for the characters is generated by resistors R603 and R604.

The video signal which enters U600 at pin 10 therefore emerges at pin 8 with any superimposed graphics such as menus, programme status information etc.

The STN_ID line at pin 39 of U700 informs U700 that there is a valid video signal. U700 then generally commands U600 to superimpose graphics onto a picture for the Set Up Programme Menu (and similar menus). However, if you press the TV/SAT key while the menu is displayed, U700 commands U600 to insert a plain coloured background instead of the picture (see also page 20).

Note that part of U600 is also used as a port expander for U700.

TV SCART

The video output at pin 8 of U600 is buffered by emitter follower Q601 and then output via R611 at pin 19 of the TV SCART. The emitter follower also supplies video to the UHF modulator. Both the TV SCART and the modulator have on-screen graphics.

VCR SCART

The video signal at pin 9 of U500 is buffered by the emitter follower Q600 and then output via R623 at pin 19 of the VCR SCART. There are no on-screeen graphics on the VCR SCART.

Decoder SCART

The video signal at pin 8 of U500 is buffered by the emitter follower Q605 and then output via R618 at pin 19 of the DECODER SCART. There are no on-screen graphics on the DECODER SCART.

➡

Output to the Modulator and Optional AV sockets

The video at the emitter of Q601 (labelled GRAPHICS_OUT in the circuit diagram) also passes via a filter comprising C202, C213, C214 and R216 to the UHF modulator. Resistors R214 and R215 attenuate the video to 500 mV pk to pk.

Note that because this video to the modulator is fed off from a point by the TV SCART, it contains on-screen graphics which will be recorded if a VCR is connected to the receiver by a UHF lead. (Video to the VCR SCART does not contain on-screen graphics.)

RGB Disable Switch

If an external MAC decoder is connected to the decoder SCART and set to RGB output, the R, G and B signals are simply looped from the decoder SCART to the TV SCART. Pin 16 of the decoder SCART is buffered to the TV SCART by Q603. When pin 16 of the TV SCART is 0 V the TV is in PAL mode, when pin 16 of the TV SCART is at 5 V the TV is in RGB mode. Pin 16 of the decoder SCART is disabled by the microprocessor U700 switching on Q602. This shorts the base of Q603 to ground which in turn switches pin 16 of the TV SCART to ground therefore disabling the TV's RGB function. RGB disable is performed when in menus, because the menus are PAL only.

UHF MODULATOR

The RF output to the TV is generated by a frequency synthesisied UHF modulator. This allows the RF output to be precisely tuned to any channel within the UHF bands IV and V (channels 21 to 69).

The circuitry consists of two main parts, a loop-through amplifier (U201) between the aerial input and the output to the TV/VCR, and the UHF modulator itself, which comprises U200 and associated components.

The heart of the modulator is the IC U200, a block diagram of which is shown on page 18. It comprises the following:

- a phase locked loop frequency synthesiser that covers the full UHF band;
- an amplitude modulator to modulate the UHF carrier with the video;
- an audio oscillator for the sound subcarrier;
- a video clamp to ensure the correct modulation index.

Tuning is enabled by a DC tuning voltage in the range 0 to 24 V being applied to the varicap diode D200.

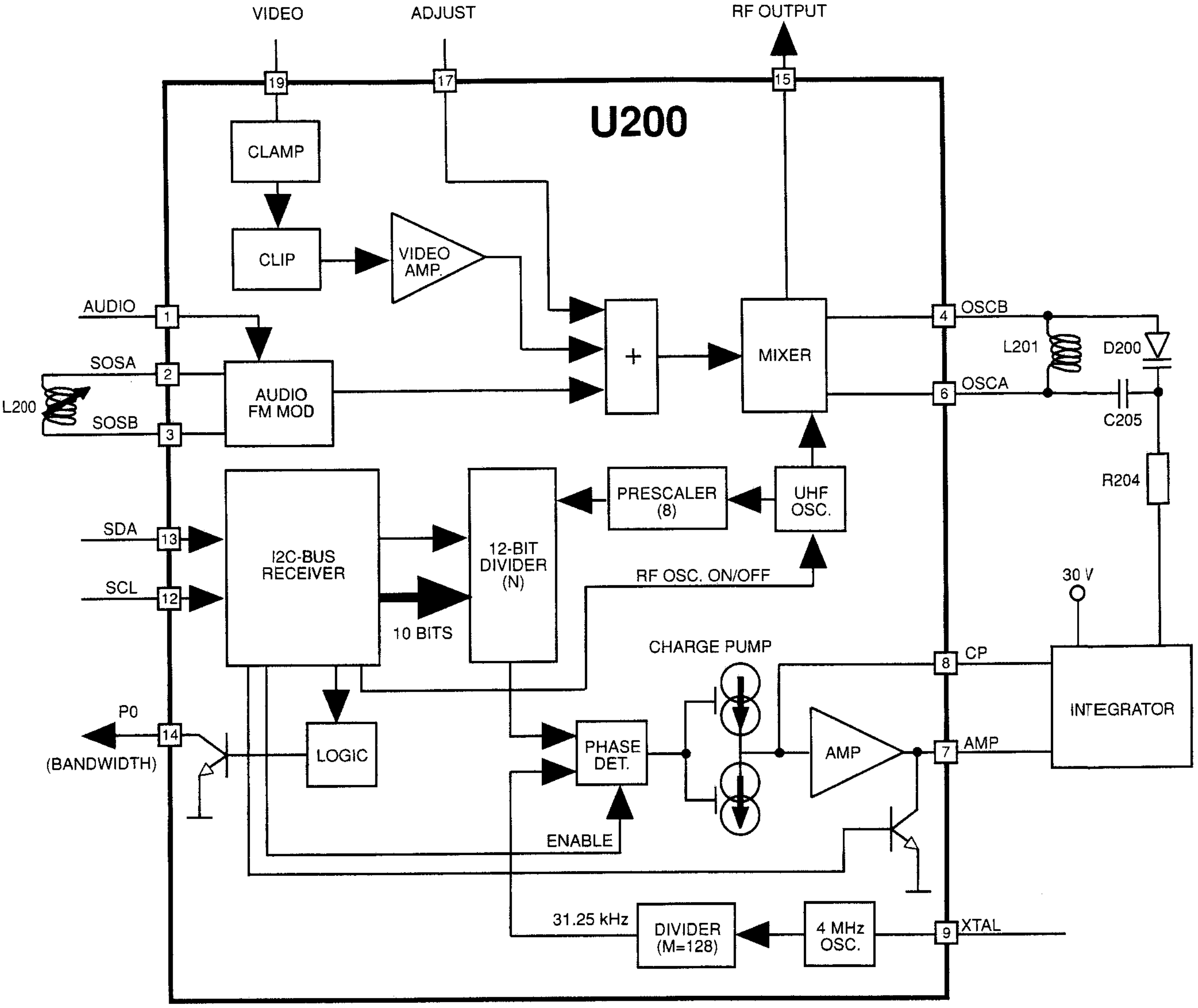
The tuning voltage is derived from pulses on pin 7 of U200. They are integrated by Q200, R207, R206, C208 and C209 and associated circuitry and eventually fed to the cathode of D200.

The audio subcarrier oscillator circuit is connected across pins 2 and 3 of U200. This is set at the audio subcarrier frequency (6 MHz for PAL I; 5.5 MHz for PAL G). The audio signals from pins 6 and 10 of the audio processor U500 are combined by R523 and R524, AC coupled by C200, pre-emphasised by C201 and R200 and then input at pin 1 of U200. The audio level at this point should be approximately 500 mV pk to pk at full volume. Note that the outputs at pins 6 and 10 of U500 are also fed to the TV SCART, so that the modulator always has the same audio source as the TV SCART.

The video signal (labelled GRAPHICS_OUT in the circuit diagram) passes via L202, which, together with C213 and C214, forms a low pass filter. Resistor R214 and R215 attenuate the video to 500 mV pk to pk. The video signal is fed into pin 19 of U200. This is used to amplitude modulate the VCO output. The modulation index is set to be 80% by resistor R213 on pin 17 of U200.

The RF output from pin 15 of U200 is fed via C217 and R217 into U201 an RF loopthrough amplifier chip which mixes the signal with the terrestrial RF channels. When the satellite receiver is in standby the UHF oscillator is switched off by U200 under control of the microprocessor U700 via the I^2C bus.

➡


VIDEO
ADJUST
RF OUTPUT
19
17
15
U200
CLAMP
CLIP
VIDEO AMP.
AUDIO
1
SOSA
2
L200
SOSB
3
AUDIO FM MOD
+
MIXER
4
OSCB
L201
D200
6
OSCA
C205
R204
PRESCALER (8)
UHF OSC.
SDA
13
SCL
12
I2C-BUS RECEIVER
12-BIT DIVIDER (N)
10 BITS
RF OSC. ON/OFF
30 V
CHARGE PUMP
8
CP
INTEGRATOR
P0
14
(BANDWIDTH)
LOGIC
PHASE DET.
AMP
7
AMP
ENABLE
31.25 kHz
DIVIDER (M=128)
4 MHz OSC.
9
XTAL

The port output bit on pin 14 of U200 is used to control the bandwidth of the tuner. Since this pin is an open collector output it must have a pull-up resistor (R112) to function properly.

SWITCH MODE POWER SUPPLY

Mains Input and Rectification

Diodes D1, D2, D3 and D4 rectify the AC mains voltage and, together with smoothing capacitor C3, provide the DC input HT for the SMPS. R1 provides inrush current limiting to protect the diode bridge. C1 and T1 form a mains filter to minimise the feedback of RFI into the mains supply. Asymmetrical mains pollution is reduced by the insertion of C6 between the primary ground and the secondary chassis ground. This component is required to satisfy the mains isolation requirements and is a safety-critical component (as are SK1, FS1, and T2). These components must only be replaced by components of the correct type (see parts lists).

SMPS Controller U1

U1 is a single chip T0220 switch mode power supply IC. It runs at approx 100 kHz. R2 and C4 determine the loop response and the power-up delay. Feedback from the sense winding (pin 7 and pin 9) is rectified by R3, D8 and C5 to provide a DC voltage which is coupled to DC outputs. When this voltage is greater than approximately 21 V current flows through D7 into the control pin of U1 reducing the switch-on time of the device hence the power supply is kept in regulation.

D5 and D6 provide the snubbing of the leakage voltages preventing them rising above the 700 V breakdown voltage of U1.

Secondary Windings of T2

The secondary windings of the transformer T2 provide the following voltages after rectification and smoothing: +5 V (pin 12), +17 V (pin 8), +22 V (pin 2) and +29 V (pin 4). The 17 V provides the supply for the LNB when set to vertical and is also sub-regulated by U3 to 12 V to provide power for U500 and U302 as well as some of the video circuitry.

The 22 V is used for the horizontal LNB supply; the 30 V is used to provide tuning volts for the modulator U200 and for the tuner.

LNB Supply Switching

U2A and Q2 act as a programmable linear regulator to provide accurate highly regulated LNB outputs. A reference voltage is applied to pin 3 of U2A via Q7, Q8, D17 and associated components. The output of the operational amplifier U2A will switch on Q2 until the voltage on pin 2 of U2A is the same as the voltage on pin 3. R18 and R19 are in the ratio of 5:1 hence 3V on pin 3 will provide approximately 15 V on the LNB supply. Q3, R16 and R17 provide current limit at 450 mA to protect Q2 and the power supply. D15, Q4 and associated components provide LNB short circuit protection. If the LNB supply drops below 10 V the transistor Q4 is turned off and the LNB_MON signal is detected by the micro controller U700. The LNB supply can be turned off by turning on Q7 which holds pin 3 of U2A at 0 V and hence the output at 0 V.

To reduce dissipation, the input to Q2 is switched by Q5, Q6 and Q1 and associated components depending if horizontal or vertical volts is selected.

By adding a 22 kHz tone via R24, R25 and C23 to pin 3 of the U2A a 22 kHz tone can be superimposed on the LNB supply.

Power Supplies during Standby

The receiver has a low power mode. If this is set at the Power-on Options then the LNB supply is turned off and both U200 and U500 are placed in low power mode thus reducing the power taken by the receiver when in standby to approximately 10 W. If this option is not set then in standby the LNB is still powered, which is necessary in very cold climates. However U200 and U500 are still placed in low power mode.

CONTROL CIRCUITRY AND DISPLAY

U700 Extension PCB

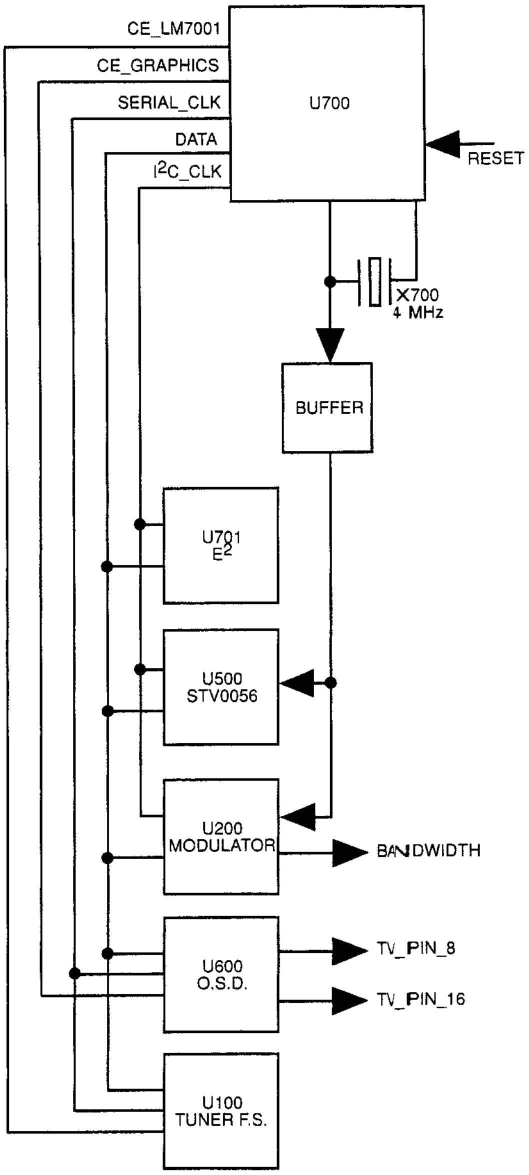
The main component in the control circuitry is U700 which is based on the Z8 microprocessor. In some receivers U700 is a custom-masked single component, but in some receivers it could be a small extension board containing a standard microprocessor and a separate ROM. This extension board contains six capacitors (C1, C2, C3, C4, C5 and C6), three ICs (U1, U3 and U4) and a 4 MHz crystal X1. The parts list is given at the end of this manual. Note that the C3, C4, C5, C6, U1, U3 and U4 in this list are quite different from the components with those labels which are on the main PCB. When the extension board is replaced by the custom-masked U700, X700, C703 and C704 on the main board are fitted.

U700 Functionality

U700 runs with a 4 MHz clock generated by crystal X700 to perform the following:

- it detects and decodes the codes received via the IR beam from the handset and those from the top panel buttons;
- it controls and sends text to the on-screen graphics IC;
- it controls the UHF modulator and the frequency synthesis loop for the tuner;
- it controls the routing of the video and audio signals;
- it controls other switching functions such as the LNB supply switching;
- it activates the front panel LEDs.

U701 is an E^2PROM which is used to store information which is set at the on-screen menus. The graphics generator IC U600 acts as a port expander for the control lines TV_PIN_8 and TV_PIN_16. the modulator chip U200 acts as a port expander for the control line bandwidth.



Control Lines

A block diagram of the serial bus interconnections is shown right. Some of U700's control functions occur via these lines; others have specific control lines which are described at the relevant points in the circuit descriptions. Some lines (e.g. LNB_MON) are inputs to U700 to inform it of conditions arising in the hardware. The line DEC_PIN_8 is an input which informs U700 that pin 8 of the DECODER SCART has gone high. The line VCR__PIN_8 is described on page 21. The TV_PIN_8 line is always an output from U700 and is also mentioned on page 23.

Reset

A reset is applied to all the microprocessors within the unit (i.e. U700 and also U300 and U303 in the VideoCrypt circuitry) when the +5 V supply falls to approximately 4.75 V. D17 generates a precise 5.1 V reference which is divided by R34 and R35 to give a 4.77 V reference to pin 5 of U2 which is acting as a comparator. If the 5 V supply at pin 6 drops below 4.77 V, the comparator output will fall to 0 V. This in turn switches off Q9 which shorts C33 to ground and so the $\overline{RST}$ reset line is held low. $\overline{RST}$ stays low until pin 5 of U2 rises above 4.77 V. If the reset line ($\overline{RST}$) is low Q314 and Q315 also switch off; this removes the +27 V (switched) supply voltage to the card reader circuitry.

DEMODULATION AND DE-EMPHASIS

All of these functions are carried out by the audio and video processor and switch matrix chip U500. The baseband input from the emitter of Q101 is filtered by C556, C555, L503, R539 and R538 which form a simple high pass filter with a chroma trap at 4.43 MHz. This strips most of the video off the baseband and the filtered signal enters U500 at pin 23. All functions are then carried out within the chip under control of the microprocessor U700.

PERIPHERAL COMPONENTS AND CONTROL LINES

U500 is controlled via the I^{2}C clock and data on pins 30 and 31 respectively. It needs a 273 kΩ 1% resistor between pin 50 and ground to produce an accurate current reference for biasing of amplifiers within the chip and it provides accurate roll-off frequencies for the audio filters. If this resistor is the wrong value or missing U500 will not function. There is one general purpose Input/Output port on pin 29 which is used as a 22 kHz source for the tone switching option (see page 19).

AUDIO BASEBAND PROCESSING AND SIGNAL ROUTING

The desired subcarrier frequency is loaded into a frequency synthesiser which sets the frequency of an internal local oscillator. When the frequency is reached the microprocessor (U700) switches in a PLL and demodulation starts.

The AMPLK pins 41 and 46 are amplitude detectors which measure approximately 3 V DC when locked to a subcarrier and measure 1.5 V DC when no carrier is present.

The DET pins 47 and 39 are the output of the left and right FM phase detectors and have audio superimposed on approximately 180 kHz. The 180 kHz is a beat frequency which appears when two subcarriers spaced by 180 kHz are input to the PLL.

The CPUMP pins 49 and 38 are the output of the frequency synthesiser which drives the voltage to pull the VCO to the target frequency. As the audio frequency is increased, the voltage on the CPUMP pins increases.

The PKOUT pins 51 and 52, form the PANDA control loop peak detector. The DC level on these pins rises during loud passages of audio and falls during quiet passages.

The FC pins 1 and 55, define the min/max roll off frequencies repectively. Audio can be seen on these pins.

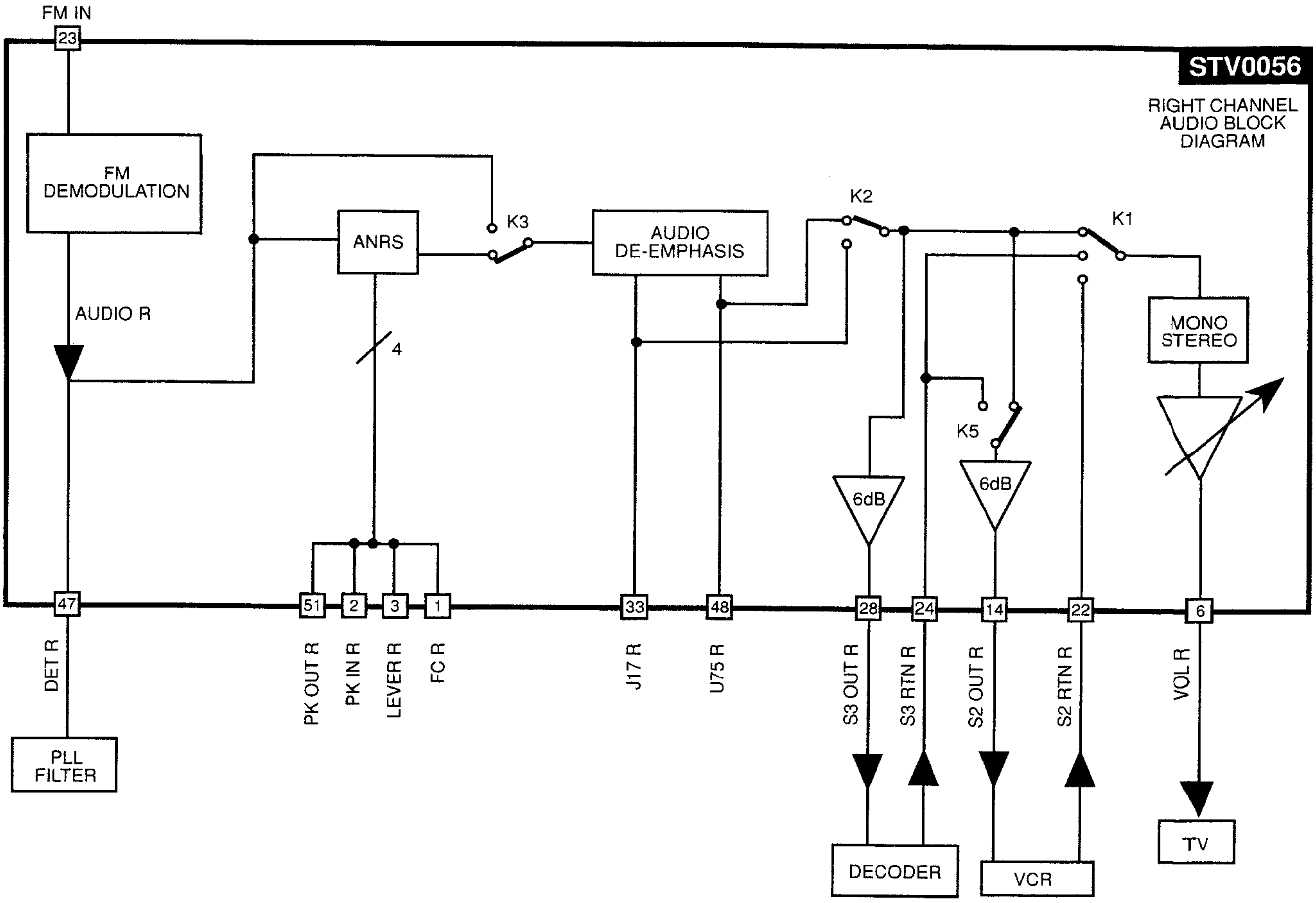
The U75 pins 48 and 40, set the de-emphasis for 50µs and 75µs respectively. The resistor and capacitor to Vref from these pins have a time constant of 75µs. A resistor inside U500 can be added in parallel which changes the time constant of the network to 50µs. Audio can be seen on these pins.

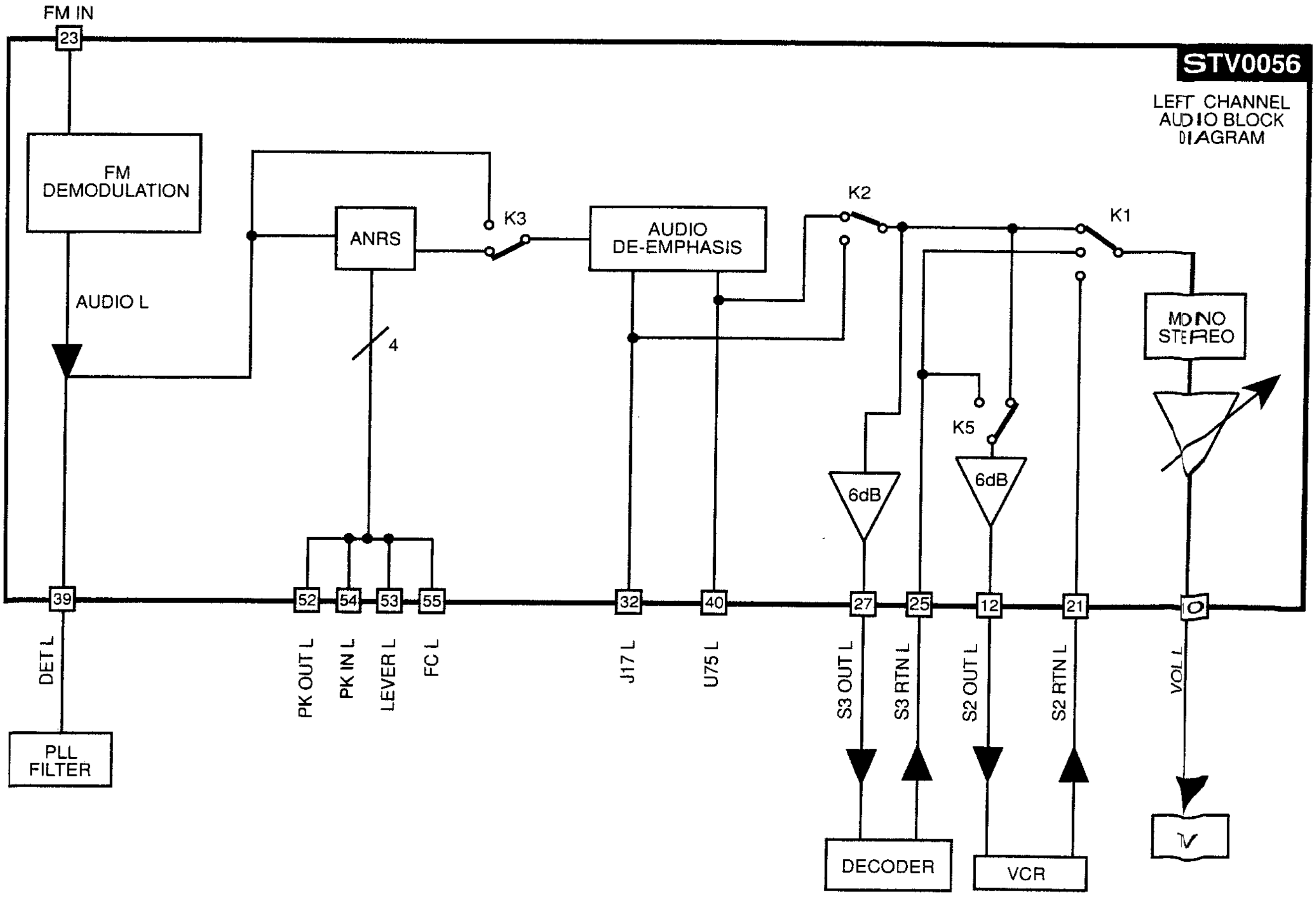
The J17 pins 32 and 33 set the de-emphasis for J17. Audio can be seen on these pins.

Switch K3 selects between PANDA and non-PANDA de-emphasis. Panda de-emphasis is the ANRS plus 75 µs. Switch K2 selects between J17, 50 µs or 75 µs. Switch K1 selects the audio source for the TV SCART, internal satellite, external decoder or VCR. Switch K5 selects the audio source for the VCR SCART, internal decoder or external decoder. The audio source for the decoder SCART is fixed to internal.

The signal routing is shown in the diagram on page 22, so if an external decoder is connected and pin 8 goes high then the decoder audio will be switched by K5 out to the VCR SCART and by switch K1 out to the TV SCART. As can be seen, the audio output on the DECODER and VCR SCARTs is of a fixed level whereas the audio output on the TV SCART has volume control. Similarly if a VCR is connected and pin 8 goes high then the VCR audio return will be switched by K1 out to the TV SCART.

➡


FM IN
23
STV0056
RIGHT CHANNEL
AUDIO BLOCK
DIAGRAM
FM
DEMODULATION
AUDIO R
ANRS
K3
4
AUDIO
DE-EMPHASIS
K2
K1
MONO
STEREO
K5
6dB
6dB
47
51
2
3
1
33
48
28
24
14
22
6
DET R
PK OUT R
PK IN R
LEVER R
FC R
J17 R
U75 R
S3 OUT R
S3 RTN R
S2 OUT R
S2 RTN R
VOL R
PLL
FILTER
DECODER
VCR
TV


FM IN
23
STV0056
LEFT CHANNEL
AUDIO BLOCK
DIAGRAM
FM
DEMODULATION
AUDIO L
ANRS
K3
4
AUDIO
DE-EMPHASIS
K2
K1
MONO
STEREO
K5
6dB
6dB
39
52
54
53
55
32
40
27
25
12
21
0
DET L
PK OUT L
PK IN L
LEVER L
FC L
J17 L
U75 L
S3 OUT L
S3 RTN L
S2 OUT L
S2 RTN L
VOL L
PLL
FILTER
DECODER
VCR
V

Decoder SCART Audio Output

The audio source for the DECODER SCART output is always FM SAT (L and R) (frequency modulated satellite signal - i.e. analogue audio). Note that the DECODER SCART is an auxiliary input and a decoder output. It can be used as an audio and video input, but only the audio from the satellite signals and selected baseband video are output, so if you were to attach a VCR to this SCART, you could record satellite audio, but you will only be able to record a good picture if the Decoder Output option at the Set Up Programme Menu is set to Clamped.

C554 (for the right channel) and C557 (for the left channel) couple the output signals from pins 28 and 27 respectively of U500 to the DECODER SCART connector. The signal level cannot be controlled by the volume rocker key on the satellite receiver handset.

VCR SCART Audio Output

The audio source for the VCR SCART output can be any one of the following:

FM SAT

DEC

C542 (for right channel) and C529 (for the left channel) couple the signals from pins 14 and 12 respectively of U500 to the VCR SCART. The signal level cannot be controlled by the volume rocker key on the satellite receiver handset.

UHF Audio Output

The audio source for the UHF output can be any of the following:

FM SAT

VCR

DEC

The signals at pins 6 and 10 of U500 are combined by R523 and R524 before being AC coupled by C200 into the modulator. C201 and R200 pre-emphasise the audio. R201 biases the audio level. The audio source for the modulator is always the same as that for the TV SCART. The signal level can be controlled by the volume rocker key on the satellite receiver handset.

TV SCART Audio Output and Phono Socket Output

Any of the following audio sources can be routed to the TV SCART:

FM SAT

VCR

DEC

The signals at pins 6 and 10 of U500 are AC coupled to the TV SCART by C527 and C528 respectively.

The signals to the TV SCART also pass to the right and left phono connectors PL601. The signal level can be controlled by the volume rocker key on the satellite receiver handset.

CIRCUIT DESCRIPTION (FOR RECEIVERS WITHOUT AN INTEGRAL DECODER)

As explained on page 14, the circuit description on pages 14 to 24 inclusive is for a receiver which has an integral VideoCrypt decoder. Most of this description also applies directly to receivers without the decoder, but there is a different sync. separator and control line STN_ID is different.

Sync. Separator

The sync. separator for receivers without an integral decoder comprises Q606, Q607, Q608 and Q609 and associated components.

Q607 is lightly biased on, but, in the presence of a clamped video signal coming in via C616, the positive-going video signal switches off Q607 by reverse biasing its base. When the negative-going sync. pulses arrive however, these switch Q607 hard on so that only the sync. pulses appear at the collector of Q607. The video signal is therefore stripped off to leave the sync. pulses.

The horizontal sync. pulses (HSYNC) are then inverted and buffered by Q608. A low-pass filter comprising R638 and C618 with R640 and R641 extracts the vertical sync. pulses (VSY), which are then inverted and buffered by Q609. Transistor Q606 is a buffer driver for the sync. pulses.

As there is no VideoCrypt IC giving the "station ID" line to indicate a valid video signal, the main microprocessor U700 performs this function by analysing the horizontal sync. pulses which pass via link J602 to enter U700 at pin 39 (line STN_ID). U700 can detect the presence of a 15.625 kHz signal and, if it detects this signal, it follows that there must be a valid signal ("station") which is generating the sync. pulses. The microprocessor U700 has a certain amount of hysteresis in its decision-making so that it can analyse noisy signals.

Fault Finding

The oscillograms which follow are divided into 5 sections: Video, Audio, SMPS, Control and VideoCrypt (including some tests that can be performed with the card reader circuitry). It is important that, within each of these sections, you check the presence of the signals in the order they are given (e.g. for the video circuitry test at points 1 to 13 in that order).

The oscillogram numbers are marked on the circuit diagrams and the PCB component ident diagrams. The oscillogram test points have been chosen to be on the more convenient side of the board (i.e. non-copper side of the main PCB). If possible, the other points where we suggest you make checks are also on this side of the PCB.

Alongside each oscillogram is a note of where the test point is, a brief description (including any special instructions) and notes on which components you need to check if your trace is not like that shown.

NOTE: The horizontal and vertical scales of each oscillogram are shown at the bottom. The 0 V point is shown by "1" with an arrow at the left-hand side; the trigger voltage is given at the bottom right-hand side and shown by an arrow at the extreme right of the trace. If the oscilloscope needs to be AC-coupled this fact is mentioned in the text, otherwise it is DC-coupled.

Generally, if you suspect that an IC is not functioning, before you try to replace it you should check the following:

- that it is receiving its supply at the appropriate pin (if it is not being supplied, trace back the supply line to the PSU to find the fault);
- that the IC is receiving instructions from U700 or port expanders via the control lines at the appropriate pins;
- that the receiver has been configured correctly at the appropriate menus (see pages 6 to 12 and also the User Manual for details).

There are several ICs within the VideoCrypt circuitry that you are not allowed to replace. If you suspect faults in this area, you must return the receiver to the Pace service centre.

➡

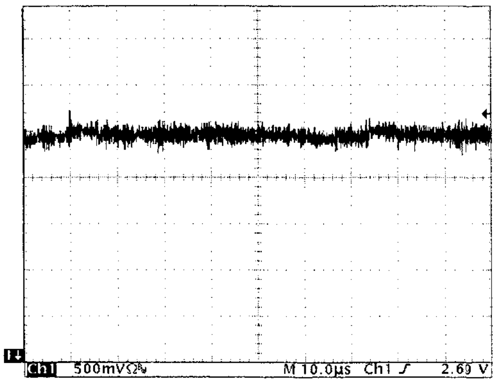
Test Point 1: Negative side of C548

Description: The trace shows tuner output (i.e. totally unfiltered video). The signal may look noisier than the trace shown if the signal is weak or the dish antenna is small.

If the trace is not as shown, check:

- that the tuning voltage on pin 15 of TUN100 changes when different programmes are selected;
- the prescaler output on pin 18 of TUN100;
- the LNB voltage on pin 5 or pin 3 of TUN100 (depending on whether the current programme is from Input 1 or Input 2 respectively). (Input 2 is only present in some models;)
- 5 V supply on pin 12 of TUN 100.

1. VIDEO MAIN PCB



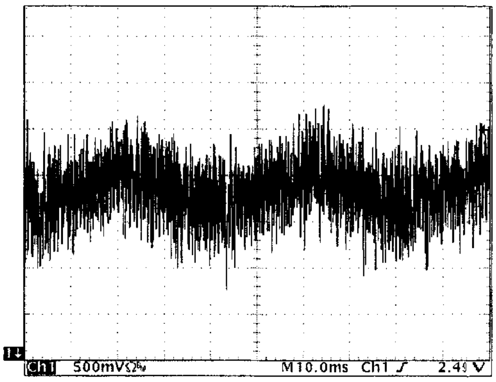
Test Point 2: Either side of L502

Description: Traces 2A and 2B show the normal video signal at test point 2, only the time axis is different; there may be slight variations in the trace, depending on picture content.

If the trace is not as shown, check:

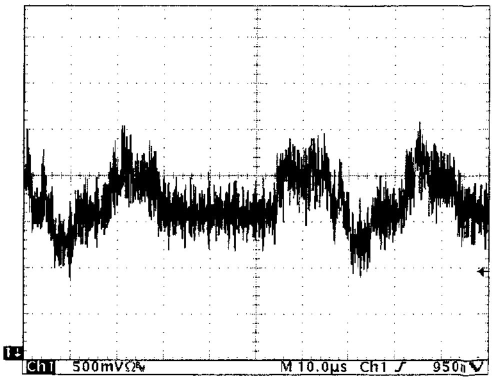
- 12 V supplies on pins 17 and 45 of U500;
- 5 V supply on pin 26 of U500;
- clock and data are present on pins 30 and 31 U500;
- 237 kΩ resistor is fitted between pin 50 and ground.

2A. VIDEO MAIN PCB



Test Point 2: Either side of L502
(see also previous Oscillogram 2A)

2B. VIDEO MAIN PCB



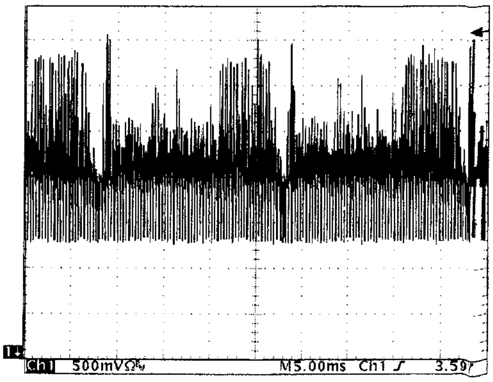
Test Point 3: LK506 (same as pin 9 of U500)

Description: The trace shows clamped video at the DC level of 2.0 V (black level). This is the video signal at the main TV output of U500.

If the trace is not at the correct DC level, check:

- the signal on pin 13 of U500 looks like trace 3. If not check back to pin 15;
- that either VCR pin 8 or decoder pin 8 is not high. This would cause the video output on pin 9 to switch to the VCR or decoder input (i.e. nothing).

3. VIDEO MAIN PCB



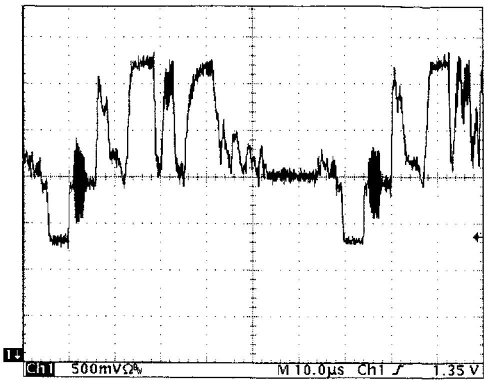
Test Point 4: LK506 (same as pin 9 of U500)

Description: This trace also shows clamped video; its DC level is important - it should be approx. 2 V black level and approx. 2 V pk to pk (sync. to bar).

If the DC level is not correct, check:

- Q600 and U600.

4. VIDEO MAIN PCB



Test Point 5: LK 600 (similar to pin 8 of U600)

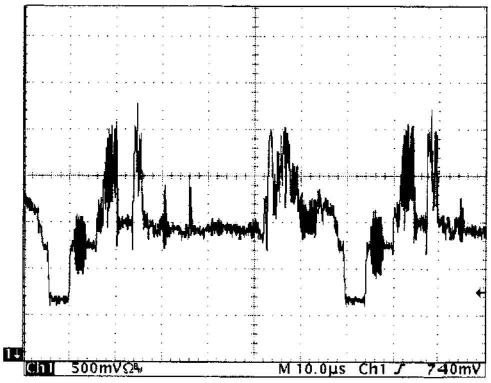
Description: Trace 5A shows the trace you would expect at test point 5 when there is a picture on the screen; trace 5B (next oscillogram) shows what to expect if there is a plain coloured background with graphics on the screen.

Check for trace 5A. If this is as expected, then select a plain coloured screen with graphics (e.g. Main Menu) and look for trace 5B.

If the trace is not as shown, check:

- that the horizontal sync is being fed into pin 18 of U600 (see oscillogram 6);
- that the vertical sync is being fed into pin 19 of U600 (see oscillogram 7).

5A. VIDEO MAIN PCB



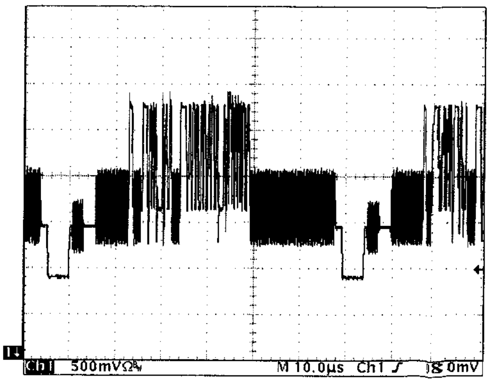
Test Point 5: LK600 (similar to pin 8 of U600) (see oscillogram 5A)

Description: Trace 5B shows what to expect at test point 5 if there is a plain coloured background with graphics on the screen. The graphics can be seen on the centre of the trace.

If the trace is not as shown, check:

- X600 is oscillating at 17.7 MHz;
- L602 is oscillating at approximately 7 MHz.

5B. VIDEO MAIN PCB



Test Point 6: LK311

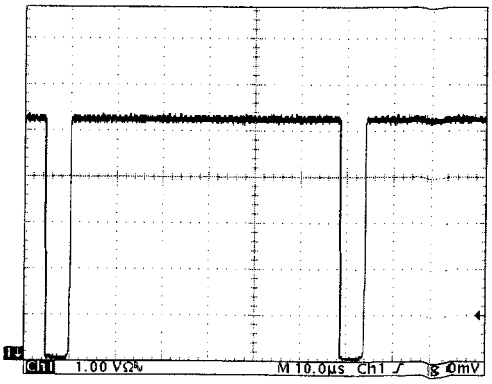
Description: The trace shows the horizontal sync. as it enters pin 18 of U600.

If the trace is not as shown, check:

- U302, Q311 and associated components in the sync. separator circuitry for receivers with an integral VideoCrypt decoder;
- Q606, Q607, Q608, Q609 and associated components in the sync. separator circuitry for receivers without an integral VideoCrypt decoder.

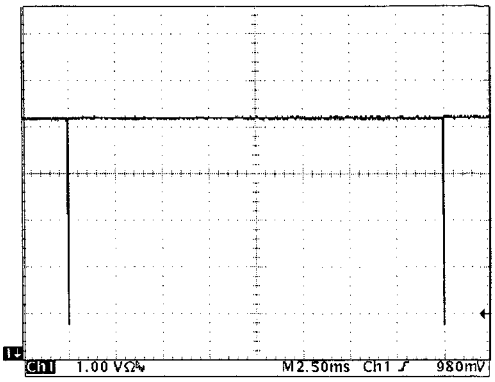
For receivers without an integral VideoCrypt decoder, check that the trace shown right is also at pin 39 of U700; if it is not, check the path including J602.

6. VIDEO MAIN PCB



➡

7. VIDEO MAIN PCB



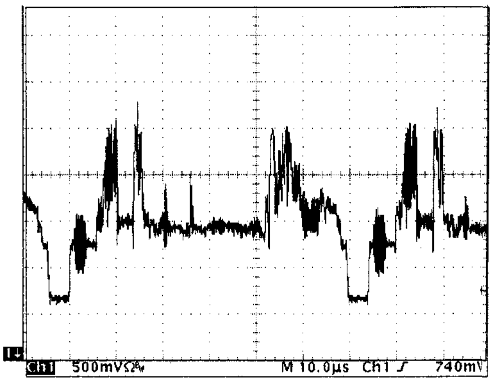
Test Point 7: LK317

Description: The trace shows the vertical sync. as it enters pin 19 of U600.

If the trace is not as shown, check:

- U302 and associated components in the sync. separator circuitry for receivers with an integral VideoCrypt decoder;
- Q606, Q607, Q608, Q609 and associated components in the sync. separator circuitry for receivers without an integral VideoCrypt decoder.

8A. VIDEO MAIN PCB



Test Point 8: Pin 19 of SK3 (TV SCART) (similar to pin 8 of U600)

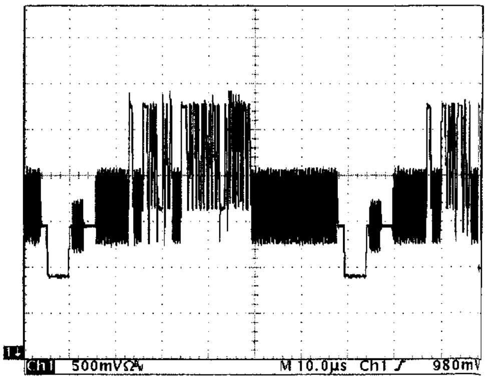
Description: Trace 8A shows the trace you would expect at test point 8 when there is a picture on the screen; trace 8B (next oscillogram) shows what to expect if there is a plain coloured background with graphics on the screen.

Check for trace 8A. If this is as expected, then select a plain coloured screen with graphics (e.g. Main Menu) and look for trace 8B.

If the trace is not as shown or has the wrong amplitude, check:

- Q601 and associated circuitry.

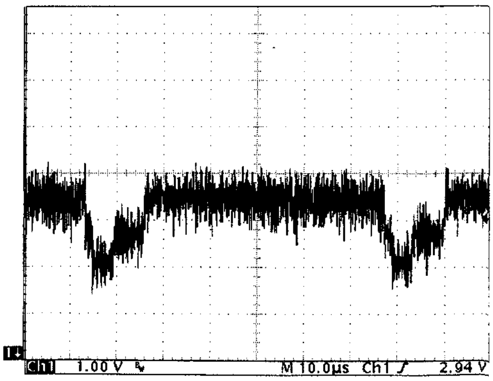
8B. VIDEO MAIN PCB



Test Point 8: Pin 19 of SK3 (TV SCART) (similar to pin 8 of U600) (see oscillogram 8A)

Description: Trace 8B shows what to expect at test point 8 if there is a plain coloured background with graphics on the screen. The graphics can be seen on the centre of the trace.

9A. VIDEO MAIN PCB



Test Point 9: Pin 19 of SK4 (DECODER SCART)

Description: The trace 9A is when PAL has been set at the "Decoder Output" option in the Set Up Programme Menu. It shows baseband video and should be approx. 2 V pk to pk. See also Oscillogram 9B below.

If the trace is not as shown or has the wrong amplitude, check:

- U500, R533, R534, R536, C541, C545 and the route from pin 8 of U500 (Q605 and associated circuitry);
- Q605 and associated components.

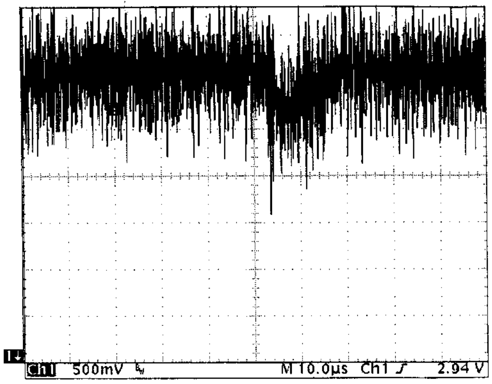
Test Point 9: Pin 19 of SK4 (DECODER SCART)

Description: The trace 9B is when "Flat" has been set at the "Decoder Output" option in the Set Up Programme Menu. It shows baseband video and should be approx. 1 V pk to pk. See also Oscillogram 9A above.

If the trace is not as shown or has the wrong amplitude, check:

- U500 and the route from pin 8 of U500.

9B. VIDEO MAIN PCB



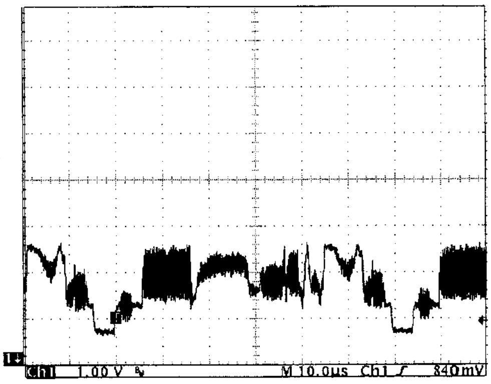
Test Point 9: Pin 19 of SK4 (DECODER SCART)

Description: The trace 9C is when "Clamped" has been set at the "Decoder Output" option in the Set Up Programme Menu. In this case, it is NOT the output from the baseband amplifier in U500 which passes to the DECODER SCART. Instead it is the clamped video signal from the energy dispersal clamp. The trace is therefore very similar to Oscillogram 8.

If the trace is not as shown, check:

- U500 and the route from pin 8 of U500.

9C. VIDEO MAIN PCB



Test Points 10: Positive sides of C527 and C528 and at LK503

Description: AC coupled oscilloscope

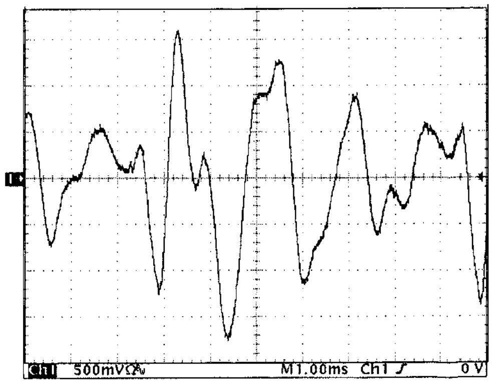
The trace should be similar at all three points. It shows the amplified audio signals for the right channel (C527) and left (C528) before they pass to the phono outputs and to the TV SCART.

The signal should be biased around 0 V, so ensure that the trace is produced with 0 V at the centre of the screen.

If the trace is not as shown, check:

- the components and circuitry back to and including U500.

10. AUDIO MAIN PCB



WARNING: While you are making the following measurement, you must NOT be earthed and the oscilloscope must NOT be earthed at its mains plug. The oscilloscope probe's earth clip must be attached to the junction of D1 and D2.
Do not touch any metal parts of the oscilloscope.

Test Point 11: Junction of pin 3 of U1 and D6

Description: AC coupled oscilloscope

The frequency of the trace varies with the input voltage and the PSU load.

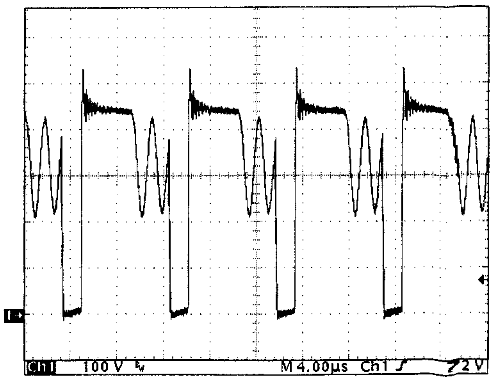
If trace is not as shown, TURN OFF THE PSU and check:

- the SMPS circuit; if fuse FS1 keeps blowing, check for shorts on any of the supply rails.

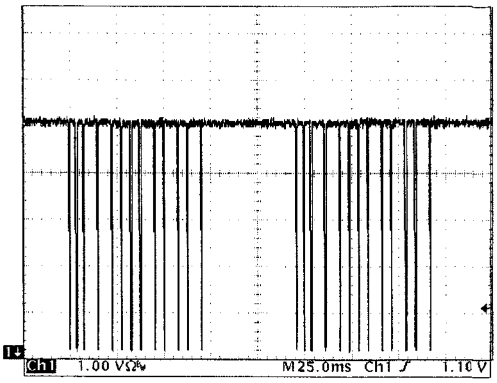
Taking heed of the WARNING above, power up the receiver again and check that:

- the voltage at pin 1 of U1 charges up to approximately 6 V then drops to approx. 5.5 V - if it does not, check FS1 or suspect U1.

11. SMPS MAIN PCB



12. CONTROL MAIN PCB



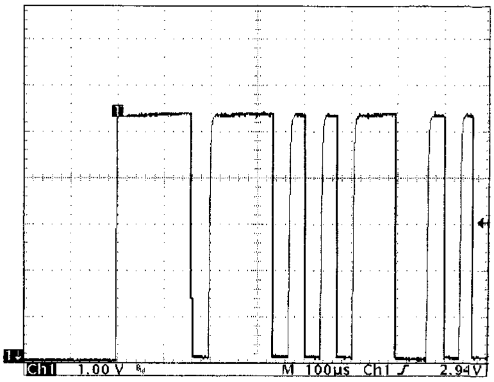
Test Point 12: LK702 (same as pin 1 of IR700)

Description: The trace shows typical data out of the IR sensor; press keys on the handset to obtain the trace.

If the trace is not as shown, check:

- the handset and IR700;
- 5 V supply to IR700.

13. CONTROL MAIN PCB



Test Point 13: LK101 (same as pin 31 of U500)

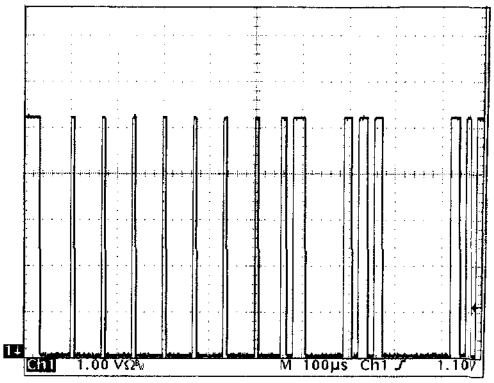
Description: The trace shows a typical data (DATA) signal when the handset keys are pressed to change the programme number.

Press the number keys while looking for the trace.

If the trace is not as shown, check:

- U700 and any of the ICs on the I²C bus or serial bus.

14. CONTROL MAIN PCB



Test Point 14: LK 715 (similar to pin 40 of U700)

Description: The trace shows a typical I²C clock (SERIAL_CLK) signal when the handset keys are pressed to change the programme number. The SERIAL_CLK line on pin 40 of U700 should be similar.

Press the number keys while looking for the trace.

If the trace is not as shown, check:

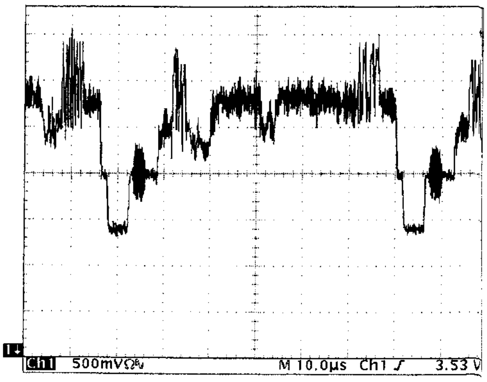
- U700 and any of the ICs on the serial bus (for SERIAL_CLK) or the I²C bus (for I2C_CLK).

Note

In VideoCrypt fault tracing, you are not permitted to swap out ICs U300, U301, U302, U303, U304 and U305, so if you suspect a fault in these ICs you must return the receiver to the Pace service centre.

---

15. VIDEOCRYPT MAIN PCB



Test Point 15: Pin 14 of U300 (VideoCrypt circuit diagram)

Description: This trace shows the clamped video input to the VideoCrypt circuitry (note it is very similar to Oscillogram 4); its DC level is important - it should be approx. 2 V black level and approx. 1.85 V pk to pk (sync. to bar).

If the DC level is not as shown, check:

- the route from pin 7 of U500.

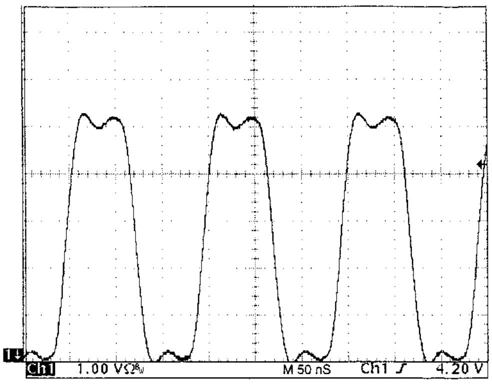
Test Point 16: LK327 (same as Pin 36 of U300. VideoCrypt circuit diagram)

Description: The trace shows the 7 MHz clock signal.

If the trace is not as shown, check:

- that X300 is oscillating at 28 MHz.

16. VIDEOCRYPT MAIN PCB



Test Points 17: Pins 23, 24, 25, 26, 27, 28, 29, 30 of U300 (VideoCrypt circuit diagram)

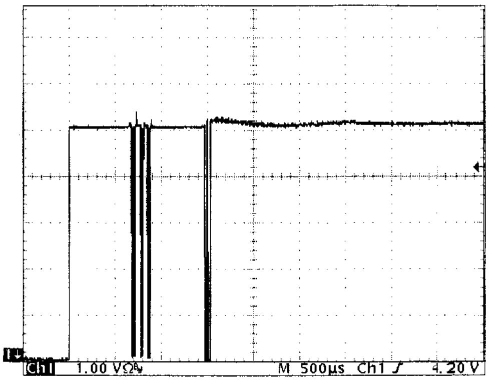
Description: The trace should look similar at all of the above test points, which are the data bus outputs of U300.

Check that all 8 bits of data are present (one bit is associated with each of the above pins). Check that the data has a similar appearance by testing at pins 14 to 21 respectively of U301, at pins 7 to 14 respectively of U303 and at pin 1 to 8 respectively of U304.

If the trace is not as shown, check:

- the appropriate IC and look for shorts or broken tracks on the data bus.

17. VIDEOCRYPT MAIN PCB



Test Point 18: Pin 19 of U302 (VideoCrypt circuit diagram)

Description: This is the video input to the sync. separator U303. Check the DC level which should be approx. 1.8 V (black level).

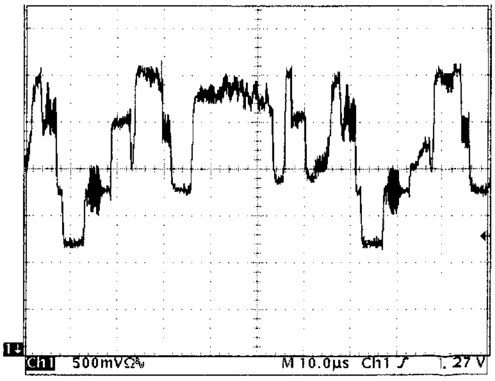
If the black level is not 1.8 V, check:

- that the signal is AC decoupled by C331 (by checking that the voltage is different at the other side of C331).

If the trace is as shown, but there is still a problem, check:

- that the STN_ID line is high (5 V) at pin 39 of U700; if it is not then suspect that U302 or associated components are faulty.

18. VIDEOCRYPT MAIN PCB



Test Point 19: X301 (VideoCrypt circuit diagram). The test point is on the underside of the PCB.

Description: The trace shows the 500 kHz clock signal.

If the trace is not as shown, check:

- R345 and X301

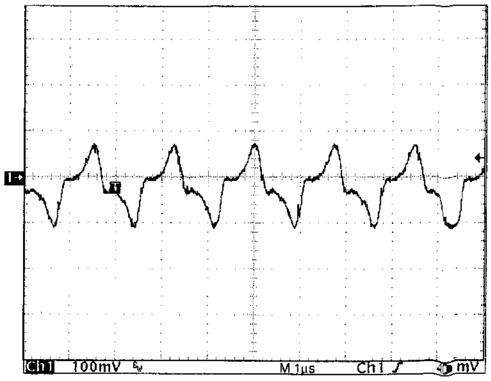
If the trace is as shown, but there is still a problem, check:

- that the reset lines ($\overline{RST}$) are greater than 4 V at the following points: U700 pin 6, U300 pin 20 and U303 pin 1 (VideoCrypt circuit diagram)

If any of the above reset lines are less than 4 V, check:

- Q5, Q7, Q8 and Q9 and associated components.

19. VIDEOCRYPT MAIN PCB



Test Point 20: Negative side of C319 (main circuit diagram)

Description: The trace shows the video signal with a scale of 2 ms per division on the time axis. There are two areas of peaks. The first (left most) is the vertical sync. and VITS; the other is the graphics. Oscillogram 20B (see next oscillogram) is a larger scale version of the graphics portion of oscillogram 20A.

The test needs to be carried out when an encrypted programme has been chosen but the viewing card is not inserted (so that graphics messages appear on the screen). Note the voltage level of the inserted graphics.

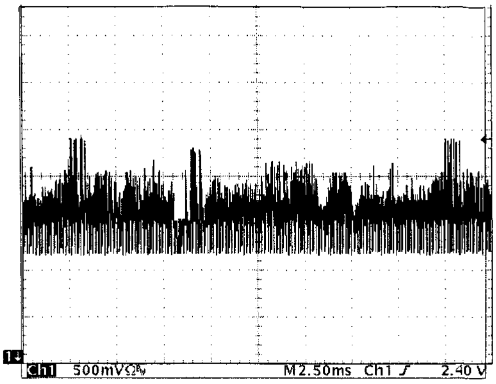
If the voltage level is not as shown on the trace, check:

- U301, Q305, Q306 and associated circuitry.

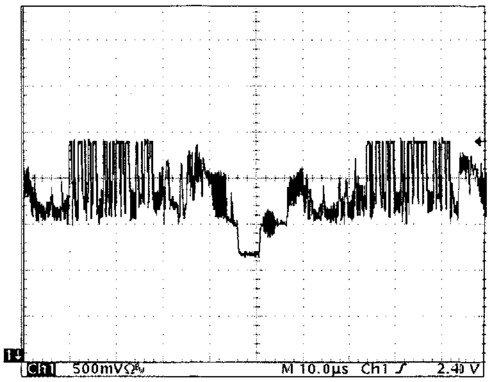
Test Point 20: Negative side of C319 (main circuit diagram)

Description: This is a larger scale version of the graphics portion of oscillogram 20A (see preceding oscillogram).

20A. VIDEOCRYPT MAIN PCB



20B. VIDEOCRYPT MAIN PCB



Checks on the Card Reader

If the receiver is showing the "CARD INVALID" message, but testing at the test points 15 to 20 has given traces as shown and you appear to have found no faulty components in the VideoCrypt circuitry, you can then carry out some further checks on the card reader circuitry as described below.

Supply to the card reader IC:

- check that the 27 V (switched) supply is present at pin 3 of U305 and 12 V is at pin 7 of U305; if the 27 V is absent, check Q314 and Q315 (VideoCrypt circuit diagram) and that the reset line (at LK333 on the VideoCrypt circuit diagram) is high.

Supply to the card reader:

Note

For the first of the two tests below we recommend that you use a **dummy** card (or a SKY card upside down), because a good, valid card could be damaged if there is a problem with the levels of VCC and VPP (which could go as high as 27 V).

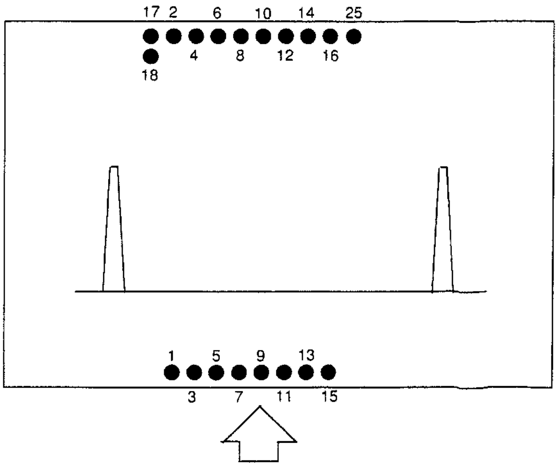
- with the **dummy card** inserted, check that VCC and VPP at pins 9 and 5 respectively of the card reader reach 5 V temporarily as the card is inserted (they do not remain at 5 V unless the card is valid); if they do not reach 5 V, check that VCC and VPP are 5 V at pins 8 and 2 respectively of U305;
- if VCC and VPP are not 5 V (or they are 5 V at U305 but there is still a problem), check the path from U305 to the card reader and also check that the card detect line (CARDDET) at pin 17 of U305 goes to 5 V when the card is inserted.

Clock to the card reader:

- check that incoming clock is present at pin 1 of U306 and the buffered clock output (approx. 3.5 MHz) is present at pin 4 of the card reader (CH3CLK line). If there is a problem the clock will be intermittent.

If there is still a problem and the above signals are present, contact the Pace service centre.

Pin Numbering for Card Reader



CARD INSERTED THIS SIDE

This is the view of the pins on the **solder side** of the board (the pins are not accessible from the component side).

Grid Refs - Ident Diagrams for the Main PCB

* = not fitted
† = mounted on copper (SMD) side of PCB
^ = actually a link (in an inductor position)
# = only fitted if dual bandwidth receiver
$ = only fitted if dual LNB inputs present

NOTE: Links and zerohm resistors in the "options" circuitry are fitted, even if the receiver does not have the option.

CAPACITORS

C1	C10
C2	E9
C3	E9
C4	E11
C5	E11 †
C6	F11
C7	G10
C8	H10 †
C9	H10
C10	I9
C11	H9 †
C12	H9
C13	I10
C14	H10 †
C15	I10 †
C16	H10
C17	I10
C18	H11 †
C19	H11
C20	I11
C21	G8 †
C22	G8 †
C23	G8 †
C24	D6 †
C25	D7
C26	F5 †
C27	F5
C28	J9 †
C29	I9
C30	H7
C31	G7
C32	G7 †
C33	H8
C34	F2 †
C100	D2
C101	C4 †
C102	F3 †
C103	F3 †
C104	E3 †
C105	F3
C106	C4 †
C107	C4 †
C108	E3 †
C109	F3
C110	F3 †
C111	F3 †
C112	B4 †
C113	B4 †$
C114	C4 $
C115	D4
C116	C4 †
C117	B4 †
C118	D2 $
C119	B4 †
C120	D3 $
C121	F3 †
C200	D2
C201	C2 †
C202	C2 †
C203	C2 †
C204	D3 †
C205	C2 †
C206	C3 †
C207	D3 †
C208	D3 †
C209	C3 †
C210	C3 †
C211	C2 †
C212	C2 †
C213	C2 †
C214	C2 †
C215	C2 †
C216	C2 †
C217	C2 †
C218	B3 †
C219	C3 †
C220	B3
C221	B2 †
C222	B3 †
C223	B3 †
C224	B3 †
C225	B2 †
C226	C3 †
C227	B2 †
C300	G5 †
C301	G6 †
C302	G5 †
C303	G5 †
C304	G6 †
C305	G6 †
C306	H6 †
C307	G5
C308	H6 †
C309	H6 †
C310	H6 †
C311	H6 †
C312	H6 †
C313	H6 †
C314	G4 †
C315	G4 †
C316	G4 †
C317	G5 †
C318	G3 †
C319	G4 †
C320	F4 †
C321	E4 †
C322	E4 †
C323	I7
C324	I7 †
C325	I2
C326	J4
C327	J4 †
C328	I7 †
C329	I8
C330	H6 †
C331	I8 †
C332	I8 †
C333	I8 †
C334	I8 †
C335	J8 †
C336	I9
C337	J8 †
C338	J9 †
C339	J8
C340	J8 †
C341	J8
C342	J4 †
C343	H3 †
C344	J2 †
C345	I6 †
C346	H6 †
C347	H5 †
C348	J4 †
C349	H5 †
C350	I3
C351	I4 †
C352	H5 †
C353	H3 †
C354	G5 †
C355	I4 †
C356	I2 †
C357	I2 †
C358	J3 †
C500	F6 †
C501	E6 †
C502	E6 †
C503	E5 †
C504	E7
C505	F5 †
C506	F5
C507	E5 †
C508	E5 †
C509	E5 †
C510	E5 †
C511	E5 †
C512	F4
C513	E5 †
C514	E5 †
C515	E5 †
C516	E4 †
C517	E4
C518	E5 †
C519	E4 †
C520	E4 †
C521	E4 †
C522	E4 †
C523	E4 †
C524	E4 †
C525	E5 †
C526	E4 †
C527	D7
C528	D6
C529	C5
C530	D5 †
C531	C5 †
C532	D5 †
C534	C5 †
C535	C6 †
C536	C5 †
C537	C5 †
C538	C6 †
C539	C6 †
C540	C6 †
C541	E5 †
C542	C5
C543	C5 †
C544	E5 †
C545	C6
C546	C6
C547	C6
C548	D4
C549	E6 †
C550	C6
C551	C6
C552	E6 †
C553	C7
C554	C7
C555	D6 †
C556	E6 †
C557	D4 †
C558	E4 †
C600	C8
C601	D8
C602	D8 †
C603	B9 †
C604	C8
C605	C8 †
C606	B9 †
C607	C9 †
C608	C9
C609	C9 †
C610	C9 †
C611	B8
C612	C4 †
C613	B4 †
C614	D8 †
C615	H7 †
C616	H7 †
C617	H7 †
C618	I8 †
C700	K8 †
C701	J8
C702	F7 †
C703	F7 †
C704	F8 †
C705	F8 †
C706	D7 †
C707	D7 †
C708	D7 †

DIODES

D1	D10
D2	D10
D3	C10
D4	D10
D5	E10
D6	E10
D7	E10
D8	E10
D9	G10
D10	G9
D11	G10
D12	G11
D13	F8
D14	G8
D15	F6
D16	G8
D17	H8
D18	J10
D19	J10
D200	C2 †
D300	I9
D301	I9
D302	I7
D303	I7
D304	I7
D305	I3
D306	I3
D307	I3
D308	I3
D309	I3
D310	I3
D311	I2
D312	I2
D313	I2
D600	C8
D601	B9
D602	B7
D603	D8
D604	D8
D605	D8
D606	D8

INDUCTORS

L1	C11 *
L2	B10 *
L3	I9
L4	H9
L5	I10 *
L6	I10
L7	I11 *
L8	I11
L9	E2
L10	E6
L11	F5
L100	B4
L101	D3 ^
L200	C2
L201	C2
L202	C2
L203	C3
L204	B3
L300	G5
L301	G6
L302	E4
L303	J8
L304	H6
L305	H6
L306	H6
L500	C5 *
L501	C5
L502	D6
L503	D6
L600	B9
L601	D8
L602	C9

LINKS

J1	G8
J100	C4 *
J101	E2
J102	E2
J300	J4
J301	J3
J302	J4
J303	J4
J600	B8
J601	B8
J602	H8
LK1	B10
LK2	C11
LK3	H9
LK4	G7
LK5	E2
LK6	G7
LK7	G5
LK100	C3
LK101	F5
LK105	E3
LK106	C3
LK107	D3
LK108	E3
LK109	E3
LK200	D3
LK201	E3
LK202	B2
LK203	C3
LK204	B3
LK300	I4
LK301	I4
LK302	G6
LK303	G6
LK304	G7
LK305	D4
LK306	F5
LK307	J3
LK308	J3
LK309	I7
LK310	I6
LK311	H8
LK312	I4
LK313	J4
LK314	J3
LK315	H7
LK316	H7
LK317	I8
LK318	J6
LK319	I6
LK320	I6
LK321	J6
LK322	J6
LK323	I6
LK324	J6
LK325	J6
LK326	I5
LK327	I4
LK328	K5
LK329	I6
LK330	J6
LK331	K4
LK332	I4
LK333	I3
LK334	I3
LK335	H5
LK336	H3
LK337	I5
LK401	E7
LK500	F7
LK501	E5
LK502	E5
LK503	D4
LK504	H7
LK505	E6
LK506	D7
LK507	D5
LK508	D5
LK600	B7
LK601	C8
LK602	C8
LK603	C7
LK604	C7
LK605	B8
LK606	C4
LK607	C7
LK608	C6
LK609	C7 *
LK610	C7
LK611	C7
LK612	C7
LK613	C7
LK614	E8
LK615	C7
LK616	C7
LK617	B6
LK618	B7
LK619	B6
LK620	B7
LK700	K6
LK701	K6
LK702	G7
LK703	G3
LK705	G8
LK706	G7
LK707	F7
LK708	F6
LK709	F6
LK710	E3
LK711	C3
LK712	E7
LK713	C3
LK714	E3
LK715	F6
LK800	D4
LK801	D5
LK802	D4
LK803	D8
LK804	C8
LK805	D8
LK806	D8
LK807	D3
LK808	E2
LK809	F3
LK810	H3
LK811	F7
LK812	G7
LK813	I9
LK814	G8
LK815	K8
LK816	J5
LK817	J3
LK818	E6
LK819	E4
LK820	H3
LK821	F8
LK822	F7
LK823	E4
LK824	F5
LK825	H5
LK826	K5
LK827	C5
LK828	F5
LK829	J7
LK830	J6
LK831	H5
LK832	H5
LK833	G5
LK834	I5
LK835	K5
LK836	J3
LK837	J3
LK838	J10
LK839	C8
LK840	D8
LK841	E8
LK842	K7
LK843	E7
LK844	G3
LK845	H7
LK846	F8
LK847	E6
LK848	I7
LK849	J9
LK850	I9
LK851	C2
LK852	E3
LK853	D3
LK854	E3
LK855	F3
LK856	H9
LK857	K8
LK858	J10
LK859	I9
LK860	C6
LK861	D7
LK862	E8
LK863	J10

CONNECTORS

PL100	E3
PL601	B7
PL700	E8
SK1	B10
SK600	B8
SK601	B5

TRANSISTORS

Q1	G8
Q2	E8
Q3	E8 †
Q4	G6 †
Q5	G8 †
Q6	G8 †
Q7	G7 †
Q8	F7 †
Q9	H8 †
Q100	F3 †
Q101	C4 †
Q102	E2 $
Q103	E2 $
Q104	E2 †$
Q105	E3 †$
Q106	E2 †$
Q107	E2 †$
Q200	C3 †
Q300	G5 †
Q301	G6 †
Q302	G4 †
Q303	G4 †
Q304	G4 †
Q305	G4 †
Q306	G4 †
Q307	G3 †
Q308	G3 †
Q309	G3 †
Q310	E4 †
Q311	I7 †
Q312	I8 †
Q313	F7 †
Q314	H3 †
Q315	I3
Q500	D5 †
Q501	D5 †
Q502	C5 †
Q600	C8 †
Q601	B8 †
Q602	B7 †
Q603	B7 †
Q604	B9 †
Q605	C5
Q606	H7 †
Q607	H7 †
Q608	H8 †
Q609	I8 †
Q700	F8 †

RESISTORS

R1	C10
R2	E11 †
R3	E10 †
R4	F9
R5	F10 †*
R6	F10 †
R7	I11 †*
R8	F10 †
R9	I9 †
R10	G8
R11	G8
R12	G8 †
R13	H8 †
R14	H8 †
R15	G8 †
R16	F8
R17	E8 †
R18	G7 †
R19	G8 †
R20	G7 †
R21	F6 †
R22	G6 †
R23	G6 †
R24	G8 †
R25	G8 †
R26	H7 †
R27	G7 †
R28	G7 †
R29	G7 †
R30	F7 †
R31	G8 †
R32	G7 †
R33	H8
R34	H8 †
R35	H8 †
R36	H8 †
R37	H8 †
R38	H8 †
R39	H8 †
R40	E8 †
R41	F2 †*
R42	F2 †
R43	G7 †
R100	E3 †
R101	D3 †
R102	F2 †
R103	E7 †
R104	F3 †
R105	F3 †
R106	F3 †
R107	E3 †
R108	C4 †
R109	E3 †
R110	C4 †
R111	C4 †
R112	C3 †#
R113	B4 †$
R114	B4 †$
R115	E2 $
R116	E2 $
R117	D2 $
R118	E3 $
R119	E2 †$
R120	E3 †$
R121	E2 †$
R122	D3 †$
R123	E2 †$
R124	E2 †$
R125	E2 †$
R126	F4 †$

➡

R127	E2 †$
R200	C2 †
R201	C2 †
R202	C2 †
R203	D2 †
R204	D2 †
R205	D3 †
R206	D3 †
R207	D3 †
R208	C3 †
R210	B3 †
R211	C3 †
R212	B2 †
R213	C2 †
R214	C2 †
R215	C2 †
R216	B3 †
R217	B2 †
R218	B3 †
R219	B2 †
R220	B3 †
R300	G4 †
R301	G6 †
R302	G6 †
R303	G6 †
R304	G6 †
R305	G6 †
R306	G6 †
R307	H5 †
R308	H5 †
R309	G6 †
R310	H7 †
R311	G6 †
R312	G4 †
R313	G4 †
R314	G4 †
R315	G4 †
R316	G5 †
R317	G4 †
R318	G4 †
R319	G4 †
R320	G4 †
R321	G4 †
R322	G4 †
R323	G3 †
R324	G3 †
R325	G3 †
R326	G3 †
R327	G3 †
R328	G4 †
R329	G4 †
R330	G4 †
R331	F4 †
R332	F4
R333	E4 †
R334	H5 †
R335	H5 †
R336	I7 †
R337	I7 †
R338	H6 †
R339	I7 †
R340	H6 †
R341	I8 †
R342	I7 †
R343	I8 †
R344	I8 †
R345	I8 †
R346	I8 †
R347	F7 †
R348	J8 †
R349	J9 †
R350	J8 †
R351	J7 †
R352	I8 †
R353	J7 †
R354	J4 †
R355	G7 †
R356	J5 †
R357	J5 †
R358	J3 †
R359	I4 †
R360	J5 †
R361	I6 †
R362	J7 †
R363	J7 †
R364	J7 †
R365	J7 †
R366	J7 †
R367	J7 †
R368	J7 †
R369	J8 †
R370	F7 †
R371	F6 †
R372	J4 †
R373	J7 †
R374	I6 †
R375	H6 †
R376	H4 †
R377	H5 †
R378	I3 †
R379	H5 †
R380	H5 †
R381	J3 †
R382	J4 †
R383	I4 †
R384	J4 †
R385	I4 †
R386	H5 †
R387	J4 †
R388	I5 †
R389	I5 †
R390	I5 †
R391	I5 †
R392	I5 †
R393	I5 †
R394	J4 †
R395	J5 †
R396	I4 †
R397	I5 †
R398	I5 †
R399	H5 †
R400	H3 †
R401	I3 †
R402	I3 †
R403	I3
R404	I3 †
R405	G5 †
R406	H4 †
R407	H4 †
R408	H4 †
R409	H4 †
R410	H3 †
R411	H4 †
R412	H4 †
R413	H4 †
R414	H4 †
R415	H4 †
R416	I3 †
R417	J3 †
R418	G5 †
R500	F6 †
R501	E6 †
R502	E6 †
R503	E6 †
R504	F6 †
R505	E5 †
R506	E5 †
R507	E5 †
R508	E5 †
R509	E5 †
R510	E5 †
R511	E5 †
R512	E5 †
R513	E5 †
R514	E4 †
R515	E5 †
R516	E4 †
R517	E4 †
R518	E4 †
R519	E4 †
R520	E4 †
R521	D4 †
R522	E4 †
R523	E4 †
R524	E4 †
R525	C5 †
R526	D5 †
R527	C5 †
R528	C5 †
R529	C5 †*
R530	C5 †
R531	C5 †
R532	D5 †
R533	E5 †
R534	E5 †
R535	D5 †
R536	D6 †
R537	E5 †
R538	E6 †
R539	E6 †
R540	E6 †
R541	E6 †
R542	D4 †
R543	E4 †
R600	D8 †
R601	D8
R602	B7 †
R603	C8 †
R604	C8 †
R605	C9 †
R606	C9 †
R607	B8 †
R608	B7 †
R609	B7 †
R610	B9 †
R611	B8 †
R612	B9
R613	B9
R614	B8 †*
R615	B8 †*
R616	B7 †*
R617	C4 †
R618	C5 †
R619	B7 †
R620	D8 †
R621	D7 †
R622	B4 †
R623	D8 †
R624	D7 †
R625	E7 †
R626	D8 †
R627	D8 †
R628	D8 †
R629	D8 †
R630	C5 †
R631	D5 †
R632	C5
R633	H7 †
R634	H7 †
R635	H7 †
R636	H8 †
R637	H8 †
R638	H7 †
R639	H8 †
R640	I8 †
R641	H8 †
R642	I8 †
R700	J7 †
R701	J7 †
R702	J8
R703	J9 †
R704	J9 †
R705	J9 †
R706	F7 †
R707	F7 †
R708	E7 †
R709	E7 †
R800	B8 †
R801	G4 †
R802	F7 †
R803	H6 †
R804	I5 †
R805	I5 †
R806	J3 †
R807	G4 †
R808	D5 †
R809	G5 †
R810	J4 †
R811	I5 †
R812	D4 †
INTEGRATED CIRCUITS	
U1	F11
U2	G8
U3	J9
U100	E2
U200	C2 †
U201	B2 †
U300	H6
U301	J5
U302	J8
U303	J7
U304	J5
U305	I5
U306	J3
U500	E5
U600	C8
U700	F7
U701	D7
MISC COMPONENTS	
CRD300	G4
FS1	C10
HS1	E8
HS2	E9
IR700	K6
MOD1	B3
T1	D11
T2	F10
TF1	J2
TF2	I10
TST300	K7
TUN100	C4
VDR1	C11*
X100	F2
X300	I6
X301	I8
X600	C9
X700	F8
LED700	K7
LED701	K6
SW700	J10
SW701	J9
SW702	K8

Grid Refs - Main Circuit

INTERCONNECTIONS

+12V45	A3, A3
+12V17	A3, A4
4MHZ_REF	A3, A6, B2, B6
12C_CLK	A3, A5, B1, B6
22KHZ	A3, A3
AFC	A5, B6
AUDIO_L	B4, D6
AUDIO_,MOD	B4, C2
AUDIO_R	B4, D6
B	C6, D6
BANDWIDTH	A6, C1
CE_GRAPHICS	A5, B5, C1
CE_LM7001	A5, B5
DATA	A3, B5, B5, B6, C1
DEC_IN_L	A4,D6
DEC_IN_R	A4, D6
DEC_OUT_L	A4, D6
DEC_OUT_R	A4, D6
DEC_PIN_8	A5, D6
DEC_PIN_16	C6, D6
DEC_VID_IN	B4, D6
DEC_VID_OUT	B4, D6
G	C6, D6
GRAPHICS_OUT	B6, C6
H/V	A3, A5
LEDH1	A5, A6
LEDH2	A5, A6
LNB_MON	A3, A5
LNB_ON/OFF	A3, A5
LNB_SELECT	A5, A6
LNBSPLY	A3, A6
R	C6, D6
SERIAL_CLK	A5, B5
TUNER_FS	B6, B6
TUNING_VOLTS	B6, B6
TV_PIN_16	B5, C6
TV_PIN_8	B5, C6
VCR_IN_R	A4, D6
VCR_IN_L	A4, D6
VCR_OUT_R	A4, D6
VCR_OUT _L	A4, D6
VCR_PIN_8	A5, D6
VCR_PIN_10	A5, D6
VCR_PIN_12	A5, D6
VCR_VID_IN	B4, D6
VCR_VID_OUT	B5, D6

➡

Grid Refs - Main Circuit

* = not fitted

^ = actually a link (in an inductor position)

= only fitted if dual bandwidth receiver

$ = only fitted if dual LNB inputs present

NOTE: Links and zerohm resistors in the "options" circuitry are fitted, even if the receiver does not have the option.

CAPACITORS	
C1	A1
C2	A2
C3	A2
C4	A1
C5	A2
C6	A1
C7	A2
C8	A2
C9	A2
C10	A2
C11	A2
C12	A2
C13	A2
C14	A2
C15	A2
C16	A2
C17	A2
C18	A2
C19	A2
C20	A2
C21	A3
C22	A3
C23	A3
C24	A2
C25	A2
C26	A2
C27	A2
C28	A2
C29	A2
C30	B3
C31	B3
C32	B3
C33	B3
C34	A3
C100	B6
C101	B6
C102	B5
C103	B5
C104	B6
C105	B6
C106	B6
C107	B6
C108	B67
C109	B6
C110	B6
C111	C6
C112	A5
C113	A5$
C114	A5$
C115	B6
C116	B6
C117	B6
C118	A6$
C119	A6
C120	A6$
C121	B6
C200	C2
C201	C2
C202	C2
C203	B2
C204	B2
C205	B2
C206	B2
C207	B2
C208	B2
C209	B2
C210	B2
C211	B2
C212	B2
C213	B2
C214	B1
C215	B2
C216	B2
C217	B1
C218	B2
C221	C1
C222	C1
C223	C1
C224	C1
C225	B1
C226	B1
C227	B1
C500	A3
C501	A3
C502	A4
C503	A3
C504	A3
C505	A3
C506	A4
C507	A3
C508	A3
C509	A3
C510	A4
C511	A4
C512	A3
C513	B3
C514	B3
C515	B3
C516	B3
C517	B4
C518	B3
C519	B3
C520	B4
C521	B4
C522	B3
C523	B4
C524	B4
C525	B4
C526	B4
C527	B4
C528	B4
C529	A4
C530	A4
C531	A5
C532	B5
C534	B5
C535	A5
C536	A5
C537	A5
C538	A4
C539	A4
C540	A4
C541	A4
C542	A5
C543	A5
C544	A4
C545	A4
C546	A4
C547	A4
C548	A4
C549	A4
C550	A4
C551	A4
C552	A4
C553	A4
C554	A4
C555	A4
C556	A5
C557	B4
C558	B4
C600	B5
C601	B5
C602	B5
C603	B6
C604	B5
C605	B5
C606	B5
C607	B5
C608	B5
C609	B5
C610	B5
C611	D6
C612	D6
C613	D6
C614	D6
C615	D5
C616	D5
C617	D5
C618	D5
C700	A6
C701	A6
C702	A5
C703	A5
C704	A5
C705	A5
C706	A5
C707	A5
C708	A5
C709	

DIODES	
D1	A1
D2	A1
D3	A1
D4	A1
D5	A2
D6	A2
D7	A1
D8	A2
D9	A2
D10	A2
D11	A2
D12	A2
D13	A2
D14	A3
D15	A3
D16	A3
D17	B3
D18	A2
D19	A2
D200	B2
D600	B5
D601	C6
D602	D6
D603	D6
D604	D6
D605	D6
D606	D6

INDUCTORS	
L1	A1*
L2	A1*
L3	A2
L4	A2
L5	A2*
L6	A2
L7	A2*
L8	A2
L9	A2
L10	A2
L11	A2
L100	A5
L101	A5^
L200	B2
L201	B2
L202	C1
L203	C2
L204	C1
L500	A5
L501	A5
L502	A4
L503	A4
L600	B5
L601	B5
L602	B5

LINKS	
J1	A2
J100	B6*
J101	A6
J102	A6
J600	C6
J601	C6
J602	D5
LK1	A1
LK2	A1
LK3	A2
LK4	A3
LK5	A3
LK6	B3
LK7	B3
LK100	B6
LK101	B6
LK104	B6
LK105	B6
LK106	A6
LK107	B6
LK108	A6
LK109	A6
LK200	C2
LK201	C2
LK202	C1
LK203	C1
LK204	B1
LK500	A4
LK501	A4
LK502	A3
LK503	B4
LK504	B5
LK505	B5
LK506	B5
LK507	A4
LK508	A4
LK600	B6
LK601	B5
LK602	B5
LK603	C6
LK604	C6
LK605	D6
LK606	D6
LK607	D6
LK608	D6
LK609	D6*
LK610	D6
LK611	D6
LK612	D6
LK613	D6
LK614	D6
LK615	D6
LK716	D6
LK617	D6
LK618	D6
LK619	D6
LK620	D6
LK700	A6
LK710	A6
LK702	A6
LK703	A6
LK705	A5
LK706	A5
LK707	A5
LK708	A5
LK709	A6
LK710	A6
LK711	A6
LK712	A5
LK713	A5
LK714	A5
LK715	A5
LK800	D3
LK801	D3
LK802	D3
LK803	D3
LK804	D3
LK805	D3
LK806	D3
LK807	D3
LK808	D3
LK809	D3
LK810	D3
LK811	D3
LK812	D3
LK813	D3
LK814	D3
LK815	D3
LK816	D3
LK817	D3
LK818	D3
LK819	D3
LK820	D3
LK821	D3
LK822	D3
LK823	D3
LK824	D3
LK825	D3
LK826	D3
LK827	D3
LK828	D3
LK829	D3
LK830	D3
LK831	D3
LK832	D3
LK833	D3
LK834	D3
LK835	D3
LK836	D3
LK837	D3
LK839	D3
LK840	D3
LK841	D3
LK842	D3
LK843	D3
LK844	D3
LK845	D3
LK846	D3
LK847	D3
LK848	D3
LK849	D3
LK850	D3
LK851	D2
LK852	D2
LK853	D2
LK854	D2
LK855	D2
LK856	D2
LK857	D2
LK858	D2
LK859	D2
LK860	D2
LK861	D2
LK862	D2
LK863	D2

CONNECTORS	
PL100	B6
PL601	
PL700	
SK1	
SK600	
SK601	

TRANSISTORS	
Q1	A2
Q2	A3
Q3	A3
Q4	A3
Q5	A3
Q6	A2
Q7	A3
Q8	A3
Q9	B3
Q100	B6
Q101	A5
Q102	A6$
Q103	A6$
Q104	A6$
Q105	A6$
Q106	A6$
Q107	A6$
Q200	B2
Q500	B4
Q501	B5
Q502	A5
Q600	B5
Q601	B5
Q602	C6
Q603	C6
Q604	C6
Q605	B4
Q606	D5
Q607	D5
Q608	D5
Q609	D5
Q700	A5

RESISTORS	
R1	A1
R2	A1
R3	A2
R4	A1
R5	A2*
R6	A2
R7	A2*
R8	A2
R9	A2
R10	C1
R11	A2
R12	A2
R13	A3
R14	A3
R15	A3
R16	A3
R17	A3
R18	A3
R20	A3
R21	A3
R22	A3
R23	A3
R24	A3
R25	A3
R26	A3
R27	A3
R28	A3
R29	A3
R30	A3
R31	A3
R32	A3
R33	B3
R34	B3
R35	B3
R36	B3
R37	B3
R38	B3
R39	B3
R40	A3
R41	A3*
R42	A3
R43	A3
R101	B6
R102	B6
R103	B6
R104	B6
R105	B6
R106	C6
R107	C6
R108	C6
R109	C6
R110	B6
R111	A5
R112	A6#
R113	B6$
R114	B6$
R115	A6$
R116	A6$
R117	A6$
R118	A6$
R119	A6$
R120	A6$
R121	A6$
R122	A6$
R123	A6$
R124	A6$
R125	A6$
R126	A6$
R127	A6$
R200	C2
R201	C2
R202	B2
R203	B2
R204	B2
R205	B2
R206	B2
R207	B2
R208	B2
R210	B2
R211	B2
R212	B2
R213	B2
R214	B2
R215	C2
R216	C1
R217	C1
R218	B1
R219	B1
R220	C1
R500	A3
R501	A3
R502	A3
R503	A3
R504	A3
R505	A3
R506	A3
R507	A3
R508	A3
R509	B3
R511	B3
R512	B4
R513	B3
R514	B3
R515	B3
R516	B4
R517	B4
R518	B3
R519	B4
R521	B4
R522	B4
R523	B4
R524	B4
R525	B4
R526	B5
R527	A5
R528	B5
R529	A5*
R531	A5
R532	A3
R533	A4
R534	A4
R535	B4
R539	A5
R540	A4
R541	A4
R542	B4
R543	B3
R600	B5
R601	B5
R602	B5
R603	B5
R604	B5
R605	B5
R606	B5
R607	C6
R608	C6
R609	C6
R610	C6
R611	C6
R612	C6
R613	D6
R614	D6*
R615	D6*
R616	D6*
R617	D6
R618	D6
R619	D6
R620	D6
R621	D6
R622	D6
R623	D6
R624	D6
R625	D6
R626	D6
R627	D6
R628	D6
R629	D6
R630	B4
R631	B4
R632	B4
R633	D5
R634	D5
R635	D5
R636	D5
R637	D5
R638	D5
R639	D5
R640	D4
R700	A6
R701	A6
R702	A6
R703	A6
R704	A6
R705	A6
R706	A5
R707	A5
R708	A5
R709	A5
R800	D3
R801	D3
R802	D3
R803	D3
R804	D3
R805	D3
R806	D3
R807	D3
R808	D3
R809	D3
R810	D3
R811	D3
R812	D2

ICS	
U1	A2
U2	A3
U3	A2
U100	B6
U200	B2
U500	B4
U600	B5
U700	A5
U701	A5

MISC. COMPONENTS	
FS1	A1
HS1	A3
HS2	A3
IR700	A6
MOD1	B1
T1	A1
T2	A2
TUN100	B6
VDR1	A1*
X100	B6
X600	B5
X700	A5
LED700	A6
LED701	A6
SW700	A6
SW701	A6
SW702	A6

Spares - Electrical Parts List (Main Board)

NOTE: △ indicates a safety-critical component; these must only be replaced by components of the correct type as listed in these parts lists.

Capacitors

C1	△ 100NF 250V 20% CLASS X2 CAP	159-1048780
C3	47UF 400V 20% 10MM RD/EL CAP 22X21 L	155-4769780
C4	100UF 25V 5MM 20% 105C R/EL CAP 7X11 T	855-1072751
C5	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C6	△ 1N0F 250V 20% YI CLASS CAP	159-1028781
C7	220PF 1KV 10% 5MM CER CAP(DE5095) TR	159-2219651
C8	SMD 47NF 50V 10% CER CAP X7R 0805 TR	950-4735621
C9	220UF 50V 20% 5MM RD/EL CAP 10X17 L	155-2275750
C10	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C11	SMD 220NF 50V Z% CER CAP Y5V 0805 TR	950-2245951
C12	1000UF 35V 5MM 20% 105C R/E CAP 13X25 L	855-1083950
C13	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C14	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C15	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C16	1000UF 25V 5MM 20% 105C R/E CAP 13X21 L	855-1082950
C17	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C18	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C19	2200UF 16V 5MM 20% 105C R/EL CAP 13X25 L	855-2281950
C20	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C21	SMD 68PF 50V 5% CER CAP COG 0805 TR	950-6805501
C22	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C23	SMD 1N0F 50V 5% CER CAP COG 0805 TR	950-1025501
C24	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C25	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C26	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C27	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C28	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C29	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C30	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C31	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C32	SMD 100NF 50V Z% CER CAP Y5V 0805 TR	950-1045951
C33	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C34	SMD 22NF 50V 10% CER CAP X7R 0805 TR	950-2235621
C100	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C101	SMD 100PF 50V 5% CER CAP COG 0805 TR	950-1015501
C102	SMD 33PF 50V 5% CER CAP COG 0805 TR	950-3305501
C103	SMD 33PF 50V 5% CER CAP COG 0805 TR	950-3305501
C104	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C105	220UF 50V 20% 5MM RD/EL CAP 10X17 L	155-2275750
C106	SMD 100PF 50V 5% CER CAP COG 0805 TR	950-1015501
C109	1U0F 50V 20% 5MM M/LAYER CER CAP TR	157-1055751
C110	SMD 100NF 50V Z% CER CAP Y5V 0805 TR	950-1045951
C111	SMD 100NF 50V Z% CER CAP Y5V 0805 TR	950-1045951
C112	SMD 22PF 50V 5% CER CAP COG 0805 TR	950-2205501
C113	SMD 56PF 50V 5% CER CAP COG 0805 TR	950-5605501
C114	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C115	1000UF 25V 5MM 20% 105C R/E CAP 13X21 L	855-1082950
C116	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C117	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C119	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C121	SMD 330PF 50V 5% CER CAP COG 0805 TR	950-3315501
C200	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C201	SMD 3N3F 50V 5% CER CAP X7R 0805 TR	950-3325521
C202	SMD 1N0F 50V 5% CER CAP COG 0805 TR	950-1025501
C203	SMD 82PF 50V 5% CER CAP R2H 0805 TR	950-8205561
C204	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C205	SMD 18PF 50V 5% CER CAP COG 0805 TR	950-1805501
C206	SMD 22PF 50V 5% CER CAP COG 0805 TR	950-2205501
C207	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C208	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C209	SMD 220NF 50V Z% CER CAP Y5V 0805 TR	950-2245951
C210	SMD 1N0F 50V 5% CER CAP COG 0805 TR	950-1025501
C211	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C212	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C213	SMD 22PF 50V 5% CER CAP COG 0805 TR	950-2205501
C214	SMD 27PF 50V 5% CER CAP COG 0805 TR	950-2705501
C215	SMD 4P7F 50V C% CER CAP COG 0805 TR	950-0475301
C216	SMD 100PF 50V 5% CER CAP COG 0805 TR	950-1015501
C217	SMD 100PF 50V 5% CER CAP COG 0805 TR	950-1015501
C218	SMD 100PF 50V 5% CER CAP COG 0805 TR	950-1015501
C220	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C221	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C222	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C223	SMD 1N0F 50V 5% CER CAP COG 0805 TR	950-1025501
C224	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C225	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C226	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C227	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C300	SMD 10PF 50V 5% CER CAP COG 0805 TR	950-1005501
C301	SMD 6P8F 50V C% CER CAP COG 0805 TR	950-0685301
C302	SMD 56PF 50V 5% CER CAP COG 0805 TR	950-5605501
C303	SMD 82PF 50V 5% CER CAP COG 0805 TR	950-8205501
C304	SMD 15PF 50V 5% CER CAP COG 0805 TR	950-1505501
C305	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C306	SMD 22PF 50V 5% CER CAP COG 0805 TR	950-2205501
C307	47UF 35V 20% 5MM RD/EL CAP 7X11 TR	155-4763751
C308	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C309	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C310	SMD 220NF 50V Z% CER CAP Y5V 0805 TR	950-2245951
C311	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C312	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C313	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C314	SMD 68PF 50V 5% CER CAP COG 0805 TR	950-6805501
C316	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C317	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C318	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C319	SMD 100PF 50V 5% CER CAP COG 0805 TR	950-1015501
C320	SMD 15PF 50V 5% CER CAP COG 0805 TR	950-1505501
C321	SMD 12PF 50V 5% CER CAP COG 0805 TR	950-1205501
C322	SMD 15PF 50V 5% CER CAP COG 0805 TR	950-1505501
C323	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C324	SMD 100PF 50V 5% CER CAP COG 0805 TR	950-1015501
C326	1U0F 50V 20% 5MM RD/EL CAP 5X11 TR	155-1055751
C327	SMD 33PF 50V 5% CER CAP COG 0805 TR	950-3305501
C328	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C329	1U0F 50V 20% 5MM RD/EL CAP 5X11 TR	155-1055751
C330	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C331	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C332	SMD 4N7F 50V 10% CER CAP X7R 0805 TR	950-4735621
C333	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C334	SMD 3N3F 50V 5% CER CAP X7R 0805 TR	950-3325521
C335	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C336	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C337	SMD 4N7F 50V 10% CER CAP X7R 0805 TR	950-4735621
C338	SMD 33NF 25V 10% CER CAP X7R 0805 TR	950-3332621
C339	4U7F 50V 20% 5MM RD/EL CAP 5X11 TR	155-4755751
C340	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C341	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C342	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C343	SMD 220NF 50V Z% CER CAP Y5V 0805 TR	950-2245951
C344	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C345	SMD 39PF 50V 5% CER CAP COG 0805 TR	950-3905501
C346	SMD 22PF 50V 5% CER CAP COG 0805 TR	950-2205501
C347	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C348	SMD 220NF 50V Z% CER CAP Y5V 0805 TR	950-2245951
C349	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C350	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C351	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C352	SMD 47NF 50V 10% CER CAP X7R 0805 TR	950-4735621
C353	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621

➡

C355	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C356	SMD 47PF 50V 5% CER CAP COG 0805 TR	950-4705501
C357	SMD 47PF 50V 5% CER CAP COG 0805 TR	950-4705501
C358	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C359	SMD 100PF 50V 5% CER CAP COG 0805 TR	950-1015501
C360	SMD 220PF 50V 5% CER CAP COG 0805 TR	950-2215501
C361	SMD 220PF 50V 5% CER CAP COG 0805 TR	950-2215501
C500	SMD 8N2F 50V 10% CER CAP X7R 0805 TR	950-8225621
C501	SMD 8N2F 50V 10% CER CAP X7R 0805 TR	950-8225621
C502	SMD 1N0F 50V 5% CER CAP COG 0805 TR	950-1025501
C503	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C504	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C505	SMD 22PF 50V 5% CER CAP COG 0805 TR	950-2205501
C506	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C507	SMD 10PF 50V 5% CER CAP COG 0805 TR	950-1005501
C508	SMD 2N7F 50V 5% CER CAP X7R 0805 TR	950-2725521
C509	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C510	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C511	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C512	470UF 35V 20% 5MM RD/EL CAP 10X20 L	155-4773750
C513	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C514	SMD 10PF 50V 5% CER CAP COG 0805 TR	950-1005501
C515	SMD 22PF 50V 5% CER CAP COG 0805 TR	950-2205501
C516	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C517	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C518	SMD 2N7F 50V 5% CER CAP X7R 0805 TR	950-2725521
C519	SMD 1N0F 50V 5% CER CAP COG 0805 TR	950-1025501
C520	SMD 47NF 50V 10% CER CAP X7R 0805 TR	950-4735621
C521	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C522	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C523	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C524	SMD 47NF 50V 10% CER CAP X7R 0805 TR	950-4735621
C525	SMD 1N0F 50V 5% CER CAP COG 0805 TR	950-1025501
C526	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C527	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C528	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C529	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C530	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C531	SMD 12PF 50V 5% CER CAP COG 0805 TR	950-1205501
C532	SMD 68PF 50V 5% CER CAP COG 0805 TR	950-6805501
C534	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C535	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C536	SMD 68PF 50V 5% CER CAP COG 0805 TR	950-6805501
C537	SMD 12PF 50V 5% CER CAP COG 0805 TR	950-1205501
C538	SMD 68PF 50V 5% CER CAP COG 0805 TR	950-6805501
C539	SMD 10PF 50V 5% CER CAP COG 0805 TR	950-1005501
C540	SMD 33PF 50V 5% CER CAP COG 0805 TR	950-3305501
C541	SMD 82PF 50V 5% CER CAP COG 0805 TR	950-8205501
C542	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C543	SMD 150PF 50V 5% CER CAP COG 0805 TR	950-1515501
C544	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C545	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C546	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C547	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C548	4U7F 50V 20% 5MM RD/EL CAP 5X11 TR	155-4755751
C549	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C550	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C551	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C552	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C553	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C554	10UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C555	SMD 27PF 50V 5% CER CAP COG 0805 TR	950-2705501
C556	SMD 100PF 50V 5% CER CAP COG 0805 TR	950-1015501
C557	SMD 1N5F 50V 10% CER CAP X7R 0805 TR	950-1525621
C558	SMD 1N5F 50V 10% CER CAP X7R 0805 TR	950-1525621
C600	1U0F 50V 20% 5MM RD/EL CAP 5X11 TR	155-1055751
C601	47UF 35V 20% 5MM RD/EL CAP 7X11 TR	155-4763751
C602	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C603	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C604	1U0F 50V 20% 5MM RD/EL CAP 5X11 TR	155-1055751
C605	SMD 8P2F 50V C% CER CAP COG 0805 TR	950-0825301
C606	SMD 8P2F 50V C% CER CAP COG 0805 TR	950-0825301
C607	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C608	47UF 35V 20% 5MM RD/EL CAP 7X11 TR	155-4763751
C609	SMD 33PF 50V 5% CER CAP COG 0805 TR	950-3305501
C610	SMD 33PF 50V 5% CER CAP COG 0805 TR	950-3305501
C612	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C613	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C614	SMD 100PF 50V 5% CER CAP COG 0805 TR	950-1015501
C700	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951
C701	100UF 50V 20% 5MM RD/EL CAP 8X12 TR	155-1075751
C702	SMD 10NF 50V 10% CER CAP X7R 0805 TR	950-1035621
C703	SMD 47PF 50V 5% CER CAP COG 0805 TR	950-4705501
C704	SMD 22PF 50V 5% CER CAP COG 0805 TR	950-2205501
C705	SMD 220NF 25V Z% CER CAP Y5V 0805 TR	950-2242951
C706	SMD 330PF 50V 5% CER CAP COG 0805 TR	950-3315501
C707	SMD 330PF 50V 5% CER CAP COG 0805 TR	950-3315501
C708	SMD 100NF 25V Z% CER CAP Y5V 0805 TR	950-1042951

Diodes

D1	DIODE - 1N4007 TR	120-0400701
D2	DIODE - 1N4007 TR	120-0400701
D3	DIODE - 1N4007 TR	120-0400701
D4	DIODE - 1N4007 TR	120-0400701
D5	200V 3.25W ZENER DIODE - BZT03-C200	125-0320001
D6	DIODE - BYV96D (PHILIPS) TR	120-0009611
D7	15V 2% 400MW ZENER DIODE TR	125-0150201
D8	DIODE - BAV21 TR	120-0002101
D9	DIODE - BYV96D (PHILIPS) TR	120-0009611
D10	UF5402 200V RECT DIODE TR	120-0540201
D11	UF5402 200V RECT DIODE TR	120-0540201
D13	DIODE - 1N4007 TR	120-0400701
D14	DIODE - 1N4007 TR	120-0400701
D15	8V2 5% 400MW ZENER DIODE TR	125-0082501
D16	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D17	5V1 2% 400MW ZENER DIODE TR	125-0051201
D18	DIODE - 1N4007 TR	120-0400701
D19	DIODE - 1N4007 TR	120-0400701
D200	SMD DIODE-BB515 MINI PLAST TR	912-0051501
D300	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D301	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D302	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D303	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D304	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D305	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
D306	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D307	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D308	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D309	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D310	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D311	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D312	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D313	SIGNAL DIODE-1N4148 75MA 75V TR	120-0414801
D600	4V7 5% 400MW ZENER DIODE TR	125-0047501
D601	12V 5% 400MW ZENER DIODE	125-0120501
D602	4V7 5% 400MW ZENER DIODE TR	125-0047501
D603	4V7 5% 400MW ZENER DIODE TR	125-0047501
D604	4V7 5% 400MW ZENER DIODE TR	125-0047501
D605	4V7 5% 400MW ZENER DIODE TR	125-0047501
D606	4V7 5% 400MW ZENER DIODE TR	125-0047501

Inductors

L3	18UH 10% AXIAL INDUCTOR 0406 TR	130-0180611
L4	27UH 10% AXIAL INDUCTOR 0508 TR	130-0270601

➡

L6	27UH 10% AXIAL INDUCTOR 0508 TR	130-0270601
L7	27UH 10% AXIAL INDUCTOR 0508 TR	130-0270601
L9	27UH 10% AXIAL INDUCTOR 0508 TR	130-0270601
L10	10UH 5% AXIAL INDUCTOR 0305 TR	130-0100501
L11	10UH 5% AXIAL INDUCTOR 0305 TR	130-0100501
L100	10UH 5% AXIAL INDUCTOR 0305 TR	130-0100501
L101	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
L200	SOUND COIL 10UH +-5%	133-0100051
L201	7NH-COIL TINNED AIR WOUND	134-0007070
L202	33UH 5% AXIAL INDUCTOR 0305 TR	130-0330501
L203	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
L204	200NH-COIL(GOLD) AIR WOUND (PEDOKA)	134-0200080
L300	22UH 10% AXIAL INDUCTOR 0305 TR	130-0220601
L301	15UH 5% AXIAL INDUCTOR 0305 TR	130-0150501
L302	10UH 5% AXIAL INDUCTOR 0305 TR	130-0100501
L303	18UH 10% AXIAL INDUCTOR 0406 TR	130-0180611
L304	200NH-COIL(GOLD) AIR WOUND (PEDOKA)	134-0200080
L305	200NH-COIL(GOLD) AIR WOUND (PEDOKA)	134-0200080
L306	1UH 5% AXIAL INDUCTOR 0305 TR	130-0010501
L500	SOUND COIL 4.7UH +-3% SUMIDA HKS-999-035	133-0047051
L501	22UH 10% AXIAL INDUCTOR 0305 TR	130-0220601
L502	15UH 5% AXIAL INDUCTOR 0305 TR	130-0150501
L503	47UH 5% AXIAL INDUCTOR 0305 TR	130-0470531
L600	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
L601	1UH 5% AXIAL INDUCTOR 0305 TR	130-0010501
L602	15UH 5% AXIAL INDUCTOR 0305 TR	130-0150501
LED700	LED-RED 4.3MM ROUND R/A EL2013HT/F1 TR	200-3010431
LED701	LED-GREEN 4.3MM ROUND R/A EL2013GT/F1 TR	200-3110431

Links

J101	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
J102	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
J301	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
J302	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
J600	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
J601	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
LK1 TO LK709	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
LK710	47UH 5% AXIAL INDUCTOR 0305 TR	130-0470531
LK711 TO LK863	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902

Connectors

PL601	PHONO SOCKET-DUAL (JP-A2V02A)	165-2000201
SK1	⚠ LEONHARDY 07-78.1400 MAINS INPUT SKT	875-0778231
SK600	SCART SOCKET-JR21A7 21PIN R/ANGLE	163-2102113
SK601	SCART SOCKET-JR21AM13 DOUBLE DECKER	163-4221130
SW700	SWITCH-B3F6005 PCB STANDARD	204-0100502
SW701	SWITCH-B3F6005 PCB STANDARD	204-0100502
SW702	SWITCH-B3F6005 PCB STANDARD	204-0100502

Transistors

Q1	TRANSISTOR-FXT749 PNP MED POWER CBE TR	110-0074911
Q2	TRANSISTOR-TIP31A NPN POWER	110-1003101
Q3	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q4	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q5	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q6	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q7	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q8	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q9	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q100	SMD N CHAN FET-ZVN3306F SOT-23	911-0330651
Q101	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q200	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q300	SMD TRANSISTOR-BC856B PNP SOT-23	911-1085651
Q301	SMD TRANSISTOR-BC856B PNP SOT-23	911-1085651
Q302	SMD TRANSISTOR-FMMT2369A NPN SWIT SOT-23	911-0236951
Q303	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q304	SMD TRANSISTOR-BC856B PNP SOT-23	911-1085651
Q305	SMD TRANSISTOR-BC856B PNP SOT-23	911-1085651
Q306	SMD TRANSISTOR-BC856B PNP SOT-23	911-1085651
Q307	SMD TRANSISTOR-FMMT2369A NPN SWIT SOT-23	911-0236951
Q308	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q309	SMD TRANSISTOR-FMMT2369A NPN SWIT SOT-23	911-0236951
Q310	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q311	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q312	SMD TRANSISTOR-BC856B PNP SOT-23	911-1085651
Q313	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q314	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q315	TRANSISTOR-FXT749 PNP MED POWER CBE TR	110-0074911
Q500	SMD TRANSISTOR-BC856B PNP SOT-23	911-1085651
Q501	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q502	SMD TRANSISTOR-BC856B PNP SOT-23	911-1085651
Q600	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q601	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q602	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q603	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q604	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q605	TRANSISTOR-BC547B NPN TO-92 PACKAGE TR	110-1054701
Q700	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651

Resistor

R1	10R 2W +-25% METOX NON-SPIRAL RES	143-1007821
R2	SMD 10R 0.1W 5% RES 0805 TR	940-1000501
R3	SMD 22R 0.1W 5% RES 0805 TR	940-2200501
R3	SMD 47R 0.1W 5% RES 0805 TR	940-4700501
R5	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R6	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R8	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R9	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R10	1K 0.25W 5% CARBON FILM RES TR	140-1022501
R11	1K 0.25W 5% CARBON FILM RES TR	140-1022501
R12	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R13	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R14	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R15	SMD 220R 0.1W 5% RES 0805 TR	940-2210501
R16	1R5 0.25W 5% CARBON FILM RES TR	140-0152501
R17	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R18	SMD 47K 0.1W 1% RES 0805 TR	940-4730101
R19	SMD 10K 0.1W 1% RES 0805 TR	940-1030101
R21	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R22	SMD 2K2 0.1W 5% RES 0805 TR	940-2220501
R23	SMD 100K 0.1W 5% RES 0805 TR	940-1040501
R24	SMD 82K 0.1W 1% RES 0805 TR	940-8230101
R25	SMD 2K2 0.1W 5% RES 0805 TR	940-2220501
R26	SMD 47K 0.1W 1% RES 0805 TR	940-4730101
R27	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R28	SMD 82K 0.1W 1% RES 0805 TR	940-8230101
R29	SMD 82K 0.1W 1% RES 0805 TR	940-8230101
R30	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R31	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R32	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R33	4K7 0.25W 5% CARBON FILM RES TR	140-4722501
R34	SMD 1K5 0.1W 1% RES 0805 TR	940-1520101
R35	SMD 22K 0.1W 1% RES 0805 TR	940-2230101
R36	SMD 100K 0.1W 5% RES 0805 TR	940-1040501
R37	SMD 1M 0.1W 5% RES 0805 TR	940-1050501
R38	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R39	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R40	SMD 47R 0.1W 5% RES 0805 TR	940-4700501
R42	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R43	SMD 1M 0.1W 5% RES 0805 TR	940-1050501
R44	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R100	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R101	SMD 1K 0.1W 5% RES 0805 TR	940-1020501

➡

R102	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R103	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R104	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R105	SMD 2K2 0.1W 5% RES 0805 TR	940-2220501
R106	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R107	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R108	SMD 22K 0.1W 5% RES 0805 TR	940-2230501
R109	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R110	SMD 270R 0.1W 5% RES 0805 TR	940-2710501
R111	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R200	SMD 15K 0.1W 5% RES 0805 TR	940-1530501
R201	SMD 1K8 0.1W 5% RES 0805 TR	940-1820501
R202	SMD 12K 0.1W 5% RES 0805 TR	940-1230501
R203	SMD 22K 0.1W 5% RES 0805 TR	940-2230501
R204	SMD 22K 0.1W 5% RES 0805 TR	940-2230501
R205	SMD 12K 0.1W 5% RES 0805 TR	940-1230501
R206	SMD 22K 0.1W 5% RES 0805 TR	940-2230501
R207	SMD 12K 0.1W 5% RES 0805 TR	940-1230501
R208	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R210	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
R211	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
R212	SMD 75R 0.1W 5% RES 0805 TR	940-7500501
R213	SMD 470K 0.1W 5% RES 0805 TR	940-4740501
R214	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R215	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R216	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R217	SMD 22R 0.1W 5% RES 0805 TR	940-2200501
R218	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R219	SMD 39R 0.1W 5% RES 0805 TR	940-3900501
R220	SMD 22R 0.1W 5% RES 0805 TR	940-2200501
R300	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R301	SMD 330R 0.1W 5% RES 0805 TR	940-3310501
R302	SMD 2K2 0.1W 5% RES 0805 TR	940-2220501
R303	SMD 120R 0.1W 5% RES 0805 TR	940-1210501
R304	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
R305	SMD 330R 0.1W 5% RES 0805 TR	940-3310501
R306	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
R307	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R308	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R310	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R311	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R312	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
R313	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R314	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R315	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R316	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R317	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R318	SMD 270R 0.1W 5% RES 0805 TR	940-2710501
R319	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
R320	SMD 220R 0.1W 5% RES 0805 TR	940-2210501
R321	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R322	SMD 27K 0.1W 5% RES 0805 TR	940-2730501
R323	SMD 2K2 0.1W 5% RES 0805 TR	940-2220501
R324	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R325	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R326	SMD 3K3 0.1W 5% RES 0805 TR	940-3320501
R327	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R328	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R329	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R330	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R331	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R332	220R 0.25W 5% CARBON FILM RES TR	140-2212501
R333	SMD 330R 0.1W 5% RES 0805 TR	940-3310501
R334	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R335	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R336	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R337	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R338	SMD 0R0 0.1W LINK 0805 TR	940-0000501

R339	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R340	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R341	SMD 2K2 0.1W 5% RES 0805 TR	940-2220501
R342	SMD 820R 0.1W 5% RES 0805 TR	940-8210501
R343	SMD 47R 0.1W 5% RES 0805 TR	940-4700501
R344	SMD 2K7 0.1W 5% RES 0805 TR	940-2720501
R345	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R346	SMD 470K 0.1W 5% RES 0805 TR	940-4740501
R347	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R348	SMD 270K 0.1W 5% RES 0805 TR	940-2740501
R349	SMD 3K9 0.1W 5% RES 0805 TR	940-3920501
R350	SMD 2K7 0.1W 5% RES 0805 TR	940-2720501
R351	SMD 3K3 0.1W 5% RES 0805 TR	940-3320501
R352	SMD 6K2 0.1W 5% RES 0805 TR	940-6220501
R353	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R354	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R355	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R356	SMD 3K3 0.1W 5% RES 0805 TR	940-3320501
R357	SMD 33K 0.1W 5% RES 0805 TR	940-3330501
R358	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R359	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R360	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R361	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R362	SMD 56R 0.1W 5% RES 0805 TR	940-5600501
R363	SMD 56R 0.1W 5% RES 0805 TR	940-5600501
R364	SMD 56R 0.1W 5% RES 0805 TR	940-5600501
R365	SMD 56R 0.1W 5% RES 0805 TR	940-5600501
R366	SMD 56R 0.1W 5% RES 0805 TR	940-5600501
R367	SMD 56R 0.1W 5% RES 0805 TR	940-5600501
R368	SMD 56R 0.1W 5% RES 0805 TR	940-5600501
R369	SMD 56R 0.1W 5% RES 0805 TR	940-5600501
R370	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R371	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R372	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R373	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R374	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R375	SMD 1M 0.1W 5% RES 0805 TR	940-1050501
R376	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R377	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R378	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
R379	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
R380	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R381	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R382	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R383	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R384	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R385	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R386	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R387	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R388	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R389	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R390	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R391	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R392	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R393	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R394	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R395	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R396	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R397	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R398	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R399	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R400	SMD 100K 0.1W 5% RES 0805 TR	940-1040501
R401	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R402	SMD 22K 0.1W 5% RES 0805 TR	940-2230501
R403	1R0 0.25W 5% CARBON FILM RES TR	140-0102501
R404	SMD 12K 0.1W 5% RES 0805 TR	940-1230501
R405	SMD 0R0 0.1W LINK 0805 TR	940-0000501

➡

R406	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R407	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R408	SMD 10R 0.1W 5% RES 0805 TR	940-1000501
R409	SMD 10R 0.1W 5% RES 0805 TR	940-1000501
R410	SMD 10R 0.1W 5% RES 0805 TR	940-1000501
R411	SMD 10R 0.1W 5% RES 0805 TR	940-1000501
R412	SMD 1K8 0.1W 5% RES 0805 TR	940-1820501
R413	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R414	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R415	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R416	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R417	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R418	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R500	SMD 36K 0.1W 5% RES 0805 TR	940-3630501
R501	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R502	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R503	SMD 36K 0.1W 5% RES 0805 TR	940-3630501
R504	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R505	SMD 82K 0.1W 5% RES 0805 TR	940-8230501
R506	SMD 180K 0.1W 5% RES 0805 TR	940-1840501
R507	SMD 27K 0.1W 5% RES 0805 TR	940-2730501
R508	SMD 560K 0.1W 5% RES 0805 TR	940-5640501
R509	SMD 560K 0.1W 5% RES 0805 TR	940-5640501
R510	SMD 180K 0.1W 5% RES 0805 TR	940-1840501
R511	SMD 82K 0.1W 5% RES 0805 TR	940-8230501
R512	SMD 237K 0.1W 1% RES 0805 TR	940-2370191
R513	SMD 27K 0.1W 5% RES 0805 TR	940-2730501
R514	SMD 560K 0.1W 5% RES 0805 TR	940-5640501
R515	SMD 560K 0.1W 5% RES 0805 TR	940-5640501
R516	SMD 27K 0.1W 5% RES 0805 TR	940-2730501
R517	SMD 47K 0.1W 5% RES 0805 TR	940-4730501
R518	SMD 1M 0.1W 5% RES 0805 TR	940-1050501
R519	SMD 1M 0.1W 5% RES 0805 TR	940-1050501
R520	SMD 47K 0.1W 5% RES 0805 TR	940-4730501
R521	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R522	SMD 27K 0.1W 5% RES 0805 TR	940-2730501
R523	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R524	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R525	SMD 2K2 0.1W 5% RES 0805 TR	940-2220501
R526	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R527	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R528	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R529	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R530	SMD 2K7 0.1W 5% RES 0805 TR	940-2720501
R531	SMD 680R 0.1W 5% RES 0805 TR	940-6810501
R532	SMD 680R 0.1W 5% RES 0805 TR	940-6810501
R533	SMD 390R 0.1W 5% RES 0805 TR	940-3910501
R534	SMD 6K2 0.1W 5% RES 0805 TR	940-6220501
R535	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R536	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R537	SMD 12K 0.1W 5% RES 0805 TR	940-1230501
R538	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R539	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R541	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R542	SMD 47K 0.1W 5% RES 0805 TR	940-4730501
R543	SMD 47K 0.1W 5% RES 0805 TR	940-4730501
R600	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R601	100R 0.25W 5% CARBON FILM RES TR	140-1012501
R602	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R603	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R604	SMD 510R 0.1W 5% RES 0805 TR	940-5110501
R605	SMD 100K 0.1W 5% RES 0805 TR	940-1040501
R606	SMD 100K 0.1W 5% RES 0805 TR	940-1040501
R607	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R608	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R609	SMD 75R 0.1W 5% RES 0805 TR	940-7500501
R610	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R611	SMD 75R 0.1W 5% RES 0805 TR	940-7500501
R612	470R 0.25W 5% CARBON FILM RES TR	140-4712501
R613	470R 0.25W 5% CARBON FILM RES TR	140-4712501
R617	SMD 75R 0.1W 5% RES 0805 TR	940-7500501
R618	SMD 75R 0.1W 5% RES 0805 TR	940-7500501
R619	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R620	SMD 22K 0.1W 5% RES 0805 TR	940-2230501
R621	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R622	SMD 75R 0.1W 5% RES 0805 TR	940-7500501
R623	SMD 75R 0.1W 5% RES 0805 TR	940-7500501
R624	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R625	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R626	SMD 22K 0.1W 5% RES 0805 TR	940-2230501
R627	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R628	SMD 2K2 0.1W 5% RES 0805 TR	940-2220501
R629	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R630	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R631	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
R632	100R 0.25W 5% CARBON FILM RES TR	140-1012501
R700	SMD 680R 0.1W 5% RES 0805 TR	940-6810501
R701	SMD 2K2 0.1W 5% RES 0805 TR	940-2220501
R702	100R 0.25W 5% CARBON FILM RES TR	140-1012501
R703	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R704	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R705	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R706	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
R707	SMD 1K5 0.1W 1% RES 0805 TR	940-1520101
R708	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R709	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R800	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R801	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R802	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R803	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R804	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R805	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R806	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R807	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R808	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R809	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R810	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R811	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R812	SMD 0R0 0.1W LINK 0805 TR	940-0000501
R813	SMD 100R 0.1W 5% RES 0805 TR	940-1010501

ICs

U1	PWR-TOP202YAI TOPSWITCH (TO-220)	109-0020200
U2	LM358/KA358 DUAL OP AMP LOW POWER	100-0033800
U3	V/REGULATOR-LM7812 +12V 1.5A TO-220	105-0781200
U100	LM7001 FS CHIP (SANYO)	109-0700101
U200	TDA8722 I2C BUS PROG.MOD.FOR -VE VID C1	909-0872201
U201	*M*ANTENNA SIGNAL PROCESSOR TDA 8725T	909-0872501
U300	PTV110	109-0011001
U301	PTV114 (M50452A-037P MITSUBISHI)	109-0011401
U302	PTV111	109-0011101
U303	PTV112	109-0011201
U304	PTV115 (SAB8052B-P SIEMENS)	109-0011501
U305	PTV113 (10085620)	109-0011301
U306	74HC04 HEX INVERTER	102-1000400
U500	STV0056 SOUND & VIDEO PROCESSOR	109-0005500
U600	M35010-001SP DISPLAY CONT (MISUBISHI)	109-0350100
U700	8663 PROG'D OTP MSS100	808-8663100
U701	24C32 32K EE	104-0242200

Misc. Components

CARD300	SMART CARD READ-ALCATEL7001LM0408I2F/08	870-7001080
HS1	HEATSINK-TV216 POWERFIN (TO220)	202-0021300
IR700	SONY INFRA-RED REC MODULE (SBX 8020-F)	215-8020000
MOD1	MODULATOR BRACKET MSS100	315-0100000

➡

T1	MAINS FILTER-(UF2327S-253-YOR5) "TDK"	232-2327000
T2	⚠ TRANSFORMER MSS100 SERIES	237-1000200
TUN100		
	PACE PC78G01 2.15GHZ S/LNB FIXED'F'TUNER	221-2078012
X100	XTAL 5.625MHZ HC49U 50/50/10/ 30PF PAR	170-0056250
X300	XTAL 28MHZ HC49U 50/100/-20/30PF PAR 3RD	170-0280000
X301	RESONATOR- 500KHZ TYPE CSB500F47	171-0004940
X600	XTAL 17.734MHZ HC49U 20/30/10 10PF PAR	170-0177341
X700	CRYSTAL-4MHZ HC49U 50/50/-10+60 30PF PAR	170-0040000

Spares - Mechanical Parts List

1 OFF	CARTON - MSS100 SERIES PACE	412-1000200
1 OFF	BASE - MSS100 PACE	321-1000200
1 OFF	FUSECLIP-PFC5000-0202 (SMK)	201-7500001
1 OFF	KEROTHERM PAD TYPE 86/30 (14X19MM)	208-0863001
1 OFF	SPRING CLAMP-7701 TO220 FOR TV216 H/SINK	249-0770100
FS1	⚠ FUSE F1AL 20 X 5MM GLASS FAST BLOW	201-2521000
1 OFF	⚠ UK MAINS LEAD 3A 3P/PLUG (BLACK)	191-1180280
1 OFF	CABLE0COAX UHF M-TO-F 1.5M BLACK	198-0015121
2 OFF	BATTERY-1.5 V AAA	239-0015000
1 OFF	HALF NUT-3/8 FORM 32 TOI.2A	240-1380011
5 OFF	PLASTITE SCREW-4 X 1/4 POZI PAN BLACK	245-4140011
2 OFF	SCREW-M3 X 8 P/P TAP.C/W WASHER	246-3080011
1 OFF	BAG-POLYTHENE MSS100 330 X 345	400-1000200
1 OFF	COVER - MSS100 PACE	312-1000200
1 OFF	BASE - MSS 100 PACE	321-1000200
1 OFF	CARTON - MSS100 SERIES PACE	412-1000200
2 OFF	POLYSTYRENE MSS100	442-1000200
1 OFF	⚠ MANUAL MSS100 PACE IRD	502-1000200
1 OFF	PROG LIST SHEET-MSS SERIES UNBRANDED	504-1235000

Differences between the IRD and Non-IRD Models

Deleted Components

The following components are not present in models without VideoCrypt.

C300 to C314 inclusive, C316 to C324 inclusive, C326 to C353 inclusive, C355 to C358 inclusive, CARD300, D300 to D313 inclusive, J101, J102, J301, J302, L300 to L306 inclusive, L500, LK300, LK301 to LK337 inclusive, Q300 to Q315 inclusive, R3, R300 to R308 inclusive, R310 to R418 inclusive, R529, R813, TST300, U300 to U305 inclusive, U306, X300, X301

Additional or Changed Components

The following components have either been changed or added in models without VideoCrypt.

C118	10 UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C120	10 UF 50V 20% 5MM RD/EL CAP 5X11 TR	155-1065751
C540	SMD 39PF 50V 5% CER CAP COG 0805 TR	950-3905501
C543	SMD 100R 0.1W 5% RES 0805 TR	940-1010501
C615	SMD 330PF 50V 5% CER CAP COG 0805 TR	950-3315501
C616	SMD 220NF 25V 2% CER CAP Y5V 0805 TR	950-2242951
C617	SMD 100NF 25V 2% CER CAP Y5V 0805 TR	950-1042951
C618	SMD 1N0F 50V 5% CER CAP COG 0805 TR	950-1025501
J602	TINNED COPPER WIRE LINKS 0.61MM DIA	999-1099902
Q102	TRANSISTOR-FXT749 PNP MED POWER TR	110-0074911
Q103	TRANSISTOR-FXT749 PNP MED POWER TR	110-0074911
Q104	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q105	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q106	SMD TRANSISTOR-BC856B PNP SOT-203	911-1085651
Q107	SMD TRANSISTOR-BC856B PNP SOT-203	911-1085651
Q606	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q607	SMD TRANSISTOR-BC856B PNP SOT-203	911-1085651
Q608	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
Q609	SMD TRANS-BC846B/2SC2412KT146R SOT-23	911-1084651
R3	SMD ORO 0.1W LINK 0805 TR	940-0000501
R113	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R114	SMD 10K 0.1W 5% RES 0805 TR	940-1030501
R115	1K 0.25W 5% CARBON FILM RES TR	140-1022501
R116	1K 0.25W 5% CARBON FILM RES TR	140-1022501
R117	1K 0.25W 5% CARBON FILM RES TR	140-1022501
R118	1K 0.25W 5% CARBON FILM RES TR	140-1022501
R119	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R120	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R121	SMD 22R 0.1W 5% RES 0805 TR	940-2200501
R122	SMD 22R 0.1W 5% RES 0805 TR	940-2200501
R123	SMD 330R 0.1W 5% RES 0805 TR	940-3310501
R124	SMD 3K3 0.1W 5% RES 0805 TR	940-3320501
R125	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R126	SMD 4K7 0.1W 5% RES 0805 TR	940-4720501
R127	SMD 330R 0.1W 5% RES 0805 TR	940-3310501
R633	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R634	SMD 1K 0.1W 5% RES 0805 TR	940-1020501
R635	SMD 100K 0.1W 5% RES 0805 TR	940-1040501
R636	SMD 2K2 0.1W 5% RES 0805 TR	940-2220501
R637	SMD 56K 0.1W 5% RES 0805 TR	940-5630501
R638	SMD 47K 0.1W 5% RES 0805 TR	940-4730501
R639	SMD 470R 0.1W 5% RES 0805 TR	940-4710501
R640	SMD 100K 0.1W 5% RES 0805 TR	940-1040501
R641	SMD 100K 0.1W 5% RES 0805 TR	940-1040501
R642	SMD 22K 0.1W 5% RES 0805 TR	940-2230501
TUN100		
	PACE PG78G30 2.15GHZ D/LNB 15/27'F'TUNER	221-2178032
U700	8663 PROG'D OTP MSS138	808-8663150

Mechanical Parts List - Differences

The following mechanical components have either been changed or added in models without VideoCrypt.

1 OFF	COVER MSS 100 NON-IRD PACE	312-1000800
1 OFF	BASE - MSS100 NON-IRD PACE	321-1000800
1 OFF	⚠ MANUAL MSS 138 PACE NON-IRD	502-1000800

Gaining Access to the Unit

REMEMBER - SAFETY FIRST

⚠
WARNING
Before dismantling the unit always disconnect it from the mains supply.

⚠
WARNING
Remove your wrist strap before applying power to the re-assembled equipment to avoid potential shock hazards.

⚠
WARNING
The incorrect substitution of electrolytic capacitors may result in an explosion hazard.

⚠
Caution
Work on an earth mat and wear a wrist strap and earth lead to prevent electrostatic damage to components. Once the main board is removed from the casing it is fairly flexible, so handle it carefully to avoid damaging the components.

⚠
Caution
You must replace all the PCB fixings, screws etc. when the unit is re-assembled, otherwise there could be hazards due to reduced clearances.

⚠
Caution
Before you apply mains power to the unit, always ensure that the voltage rating stated on the rear panel of the unit matches the mains voltage supply in the country of installation.

⚠
Caution
Do not spray chemicals on or near the unit.

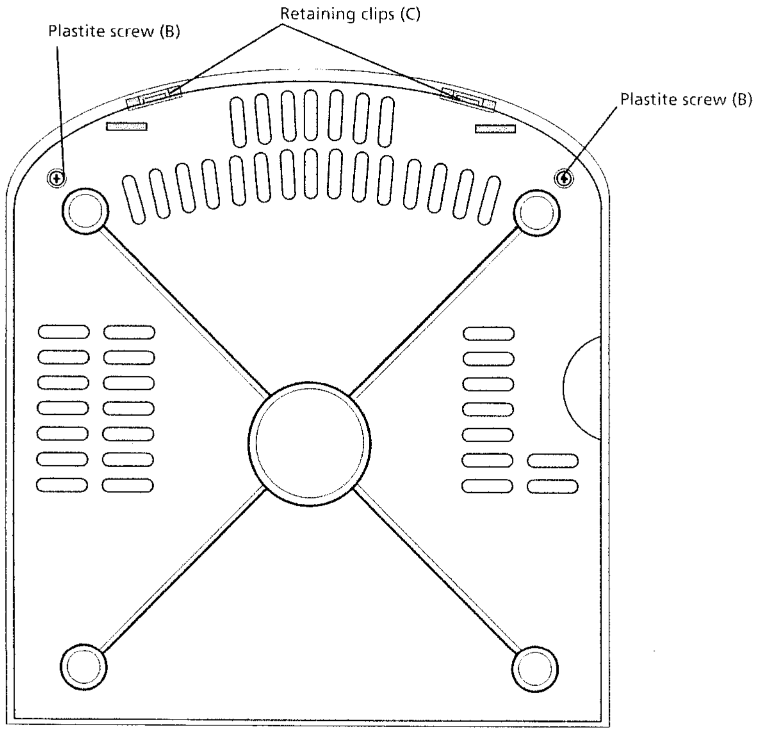
⚠
Caution
Replacements for faulty components must be of the correct value and rating and must be assembled by a competent service engineer, otherwise safety approvals could be invalidated.

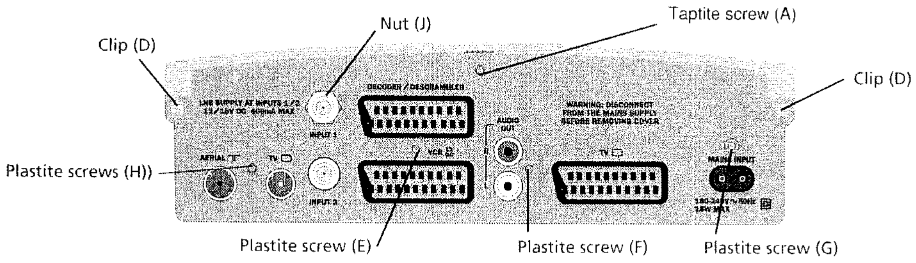
⚠
Caution
When releasing the retaining clips (C), use a flat bladed tool with a blade that has a minimum width of 1/4", otherwise the clips may snap.

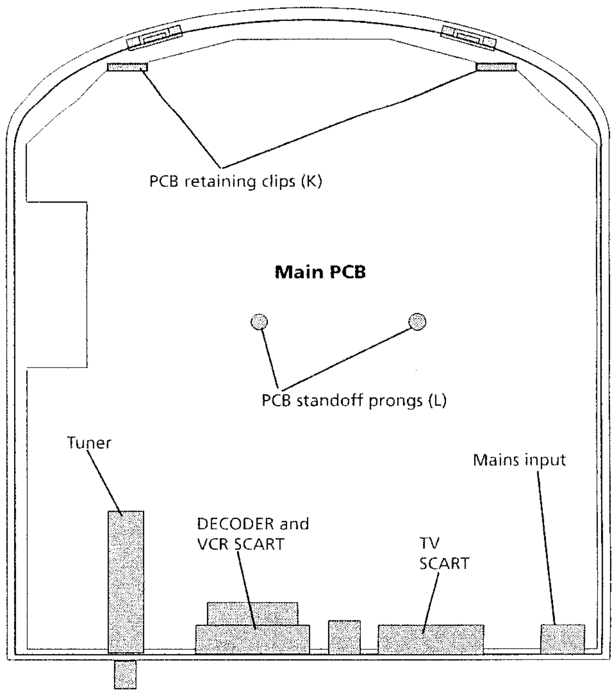
REMOVING THE TOP COVER

To remove the top cover:

- ›› Unscrew the taptite screw (A) at the rear of the unit.
- ›› Unscrew the two plastite screws (B) at the base of the unit.
- ›› At the first retaining clip (C) in the base of the unit, insert a flat bladed tool (the minimum blade width must be 1/4") between the retaining clip and its corresponding ledge. Place your thumb in the groove that separates the lid and the base of the unit. **Gently twist** the flat bladed tool to unhook the plastic retaining clip from the chassis ledge. Simultaneously, use your thumb to gently prise the lid away from the base. Repeat for the second retaining clip.
- ›› Noting that the top panel hinges on two clips (D) at the rear panel, remove the top panel.


Retaining clips (C)
Plastite screw (B)
Plastite screw (B)


Nut (J)
Taptite screw (A)
Clip (D)
Clip (D)
Plastite screws (H))
Plastite screw (E)
Plastite screw (F)
Plastite screw (G)
DECODER / DESCRAMBLER
INPUT 1
INPUT 2
AUDIO OUT
VCR
TV
MAINS INPUT
WARNING: DISCONNECT FROM THE MAINS SUPPLY BEFORE REMOVING COVER


PCB retaining clips (K)
Main PCB
PCB standoff prongs (L)
Tuner
Mains input
DECODER and VCR SCART
TV SCART

REMOVING THE MAIN PCB

To remove the main PCB:

- ›› Unscrew the rear-panel screws (E, F, G and H). Use a nut runner to remove the nut (J) from the Input 1 connector.
- ›› Gently unclip the two PCB retaining clips (K) at the edge of the Main PCB.
- ›› To free the PCB, gently lift the front edge of the board. The PCB standoff prongs (L) (near the middle of the board) should release automatically. If not, crimp the tops of the standoff prongs and gently lift the front edge of the PCB again.
- ›› Gently lift the PCB away from the rear panel.

REFITTING THE MAIN PCB

To refit the main PCB:

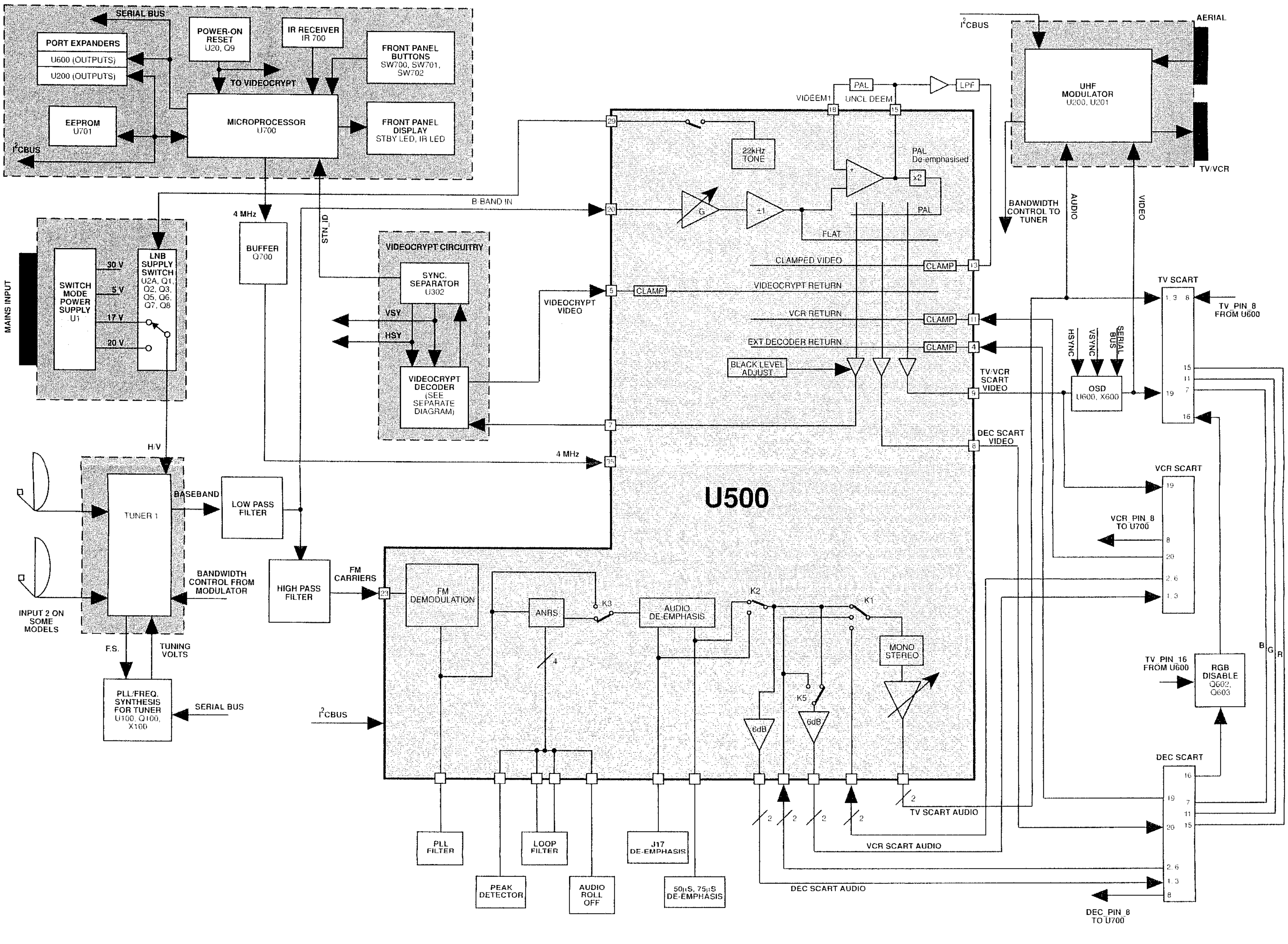
- ›› Gently insert the PCB under the four retaining plugs at the base of the rear panel.
- ›› Press the front edge of the PCB to clip the two PCB retaining clips (K) over the edge of the board. Gently press the centre of the Main PCB to ensure it is secured by the PCB standoff prongs (L).
- ›› Replace the rear-panel screws (E, F, G and H) and the nut (J) on the Input 1 connector.

REFITTING THE COVER

To refit the cover:

- ›› Insert the top panel clips (D) into their corresponding slots on the rear panel.
- ›› Press the top panel and base together until the retaining clips (C) click into place. Replace the screws (B) and (A).

Main Block Diagram


SERIAL BUS
PORT EXPANDERS
U600 (OUTPUTS)
U200 (OUTPUTS)
POWER-ON RESET U20, Q9
IR RECEIVER IR 700
FRONT PANEL BUTTONS SW700, SW701, SW702
TO VIDEOCRYPT
EEPROM U701
MICROPROCESSOR U700
FRONT PANEL DISPLAY STBY LED, IR LED
I²CBUS
MAINS INPUT
SWITCH MODE POWER SUPPLY U1
30 V
5 V
17 V
20 V
LNB SUPPLY SWITCH U2A, Q1, Q2, Q3, Q5, Q6, Q7, Q8
4 MHz
BUFFER Q700
STN_ID
B-BAND IN
VIDEOCRYPT CIRCUITRY
SYNC. SEPARATOR U302
VSY
HSY
VIDEOCRYPT DECODER (SEE SEPARATE DIAGRAM)
VIDEOCRYPT VIDEO
H/V
BASEBAND
TUNER 1
LOW PASS FILTER
4 MHz
BANDWIDTH CONTROL FROM MODULATOR
HIGH PASS FILTER
FM CARRIERS
INPUT 2 ON SOME MODELS
F.S.
TUNING VOLTS
PLL/FREQ. SYNTHESIS FOR TUNER U100, Q100, X100
SERIAL BUS
I²CBUS
29
20
5
7
35
23
18
15
13
11
4
9
8
VIDEEM1
PAL
UNCL DEEM
LPF
22kHz TONE
PAL De-emphasised
x2
G
±1
PAL
FLAT
CLAMPED VIDEO
CLAMP
VIDEOCRYPT RETURN
CLAMP
VCR RETURN
CLAMP
EXT DECODER RETURN
CLAMP
BLACK LEVEL ADJUST
TV/VCR SCART VIDEO
DEC SCART VIDEO
U500
FM DEMODULATION
ANRS
K3
AUDIO DE-EMPHASIS
K2
K1
MONO STEREO
K5
6dB
6dB
4
2
2
2
2
2
PLL FILTER
LOOP FILTER
J17 DE-EMPHASIS
PEAK DETECTOR
AUDIO ROLL OFF
50µS, 75µS DE-EMPHASIS
TV SCART AUDIO
VCR SCART AUDIO
DEC SCART AUDIO
I²CBUS
AERIAL
UHF MODULATOR U200, U201
TV/VCR
BANDWIDTH CONTROL TO TUNER
AUDIO
VIDEO
TV SCART
1, 3
8
TV_PIN_8 FROM U600
HSYNC
VSYNC
SERIAL BUS
OSD U600, X600
19
15
11
7
16
VCR SCART
19
VCR_PIN_8 TO U700
8
20
2, 6
1, 3
B
G
R
TV_PIN_16 FROM U600
RGB DISABLE Q602, Q603
DEC SCART
16
19
7
11
20
15
2, 6
1, 3
8
DEC_PIN_8 TO U700

PACE MSS 100 Series Service Broadsheet

STATUS OF THE PRODUCT

The MSS 100 series of receivers have one main PCB which contains the majority of the components. Some units also have a small microprocessor extension PCB. The main PCB is currently at Revision A1. The PCB's part number is marked on the component side of the PCB, where revision A1 is denoted by the characters 101 at the end of the part number.

If you need to find out the software version number of the receiver, you can display the Download Menu and then press the STORE key to display the second Download screen, which shows the software version number.

VIDEOCRYPT CIRCUIT DESCRIPTIONS AND DIAGRAMS

The MSS 100-I contains VideoCrypt circuitry. For copyright reasons, the circuit description and diagrams for this will be printed on special paper on a separate sheet, part of which has been overprinted with broad diagonal stripes to prevent photocopying. Each of these sheets has a unique, traceable serial number. As the card reader is intimately linked with the VideoCrypt circuitry, the description of the card reader circuitry is also given on the VideoCrypt sheet.

GENERAL SPECIFICATION

GENERAL

Number of Programmes	250
Front Panel Control	Standby, Programme Up/ Down buttons
UHF Modulator	CCIR PAL System I, Ch. 21 to 69, preset to Ch. 38
Operating Voltage	180 – 240 V AC, 50 Hz
Power Consumption	18 W (max.) optional 10 W typical in low-power standby.
Dimensions	H = 63 mm, W = 360 mm, D = 263 mm approx.
Weight	3.0 kg (typical, when packed)

CONNECTORS

TV	SCART (RGB looped from decoder SCART only and CVBS)
VIDEO RECORDER	SCART (CVBS)
DECODER	SCART
R & L (audio out)	Phono
MAINS INPUT	2-pin reversible
AERIAL	IEC female
TV	IEC male
LNB	Single (VideoCrypt models only)/Dual (Non-VideoCrypt models only)

AUDIO

Audio Bandwidth	130, 180, 200, 280, 380, 500 or 600 kHz
Audio De-emphasis	PANDA 1, 50 µs, 75 µs or J17
Tuning Frequency Range	5.00 – 9.00 MHz in 10 kHz steps, left and right frequencies are independently tunable.
Modes	Mono 1 to 9 and Stereo A to D.

TUNER

Receiving Frequency Range	700 – 2150 MHz
Polarity Switching	Vertical: 12.0 – 14.0 V, Horizontal: 17.0 – 20.0 V at 0 – 400 mA with short circuit protection
LNB Tone Switching	Amplitude: 0.6 V ±0.2 V, Frequency: 22 kHz ±2 kHz
Input Impedance	75 Ω
I. F.	479.5 MHz
I. F. Bandwidth	27 MHz or 15 MHz/27 MHz (software selectable in non-VideoCrypt models)
Input Level	–60 dBm to –30 dBm
Image Rejection	40 dB (typically)
Static Threshold	6 dB (typically)
Energy Dispersion Removal	35 dB (min.)

SCART CONNECTORS

Video Output Level	1 V p-p (±2 dB) into 75 Ω load.
Video Output Impedance	75 Ω
Video Frequency Range	50 Hz – 4.8 MHz (±3dB)
Video De-emphasis (PAL)	to CCIR 405.1 (625 lines)
Baseband Output Level	1 V p-p (±2 dB) into 75Ω load.
Baseband Frequency Range	30 Hz – 10.5 MHz (±3 dB) (Flat)
Baseband De-emphasis	PAL/Clamped/Flat, software selectable
Audio Frequency Range	30 Hz – 12 kHz
Audio Output Level	500 mV RMS into 10 k Ω

OPERATING/STORAGE CONDITIONS

Operating Temperature Range	5 – 40 °C
Storage Temperature Range	–20 – +50 °C

Due to continued product improvement, this specification is subject to change without prior notice.

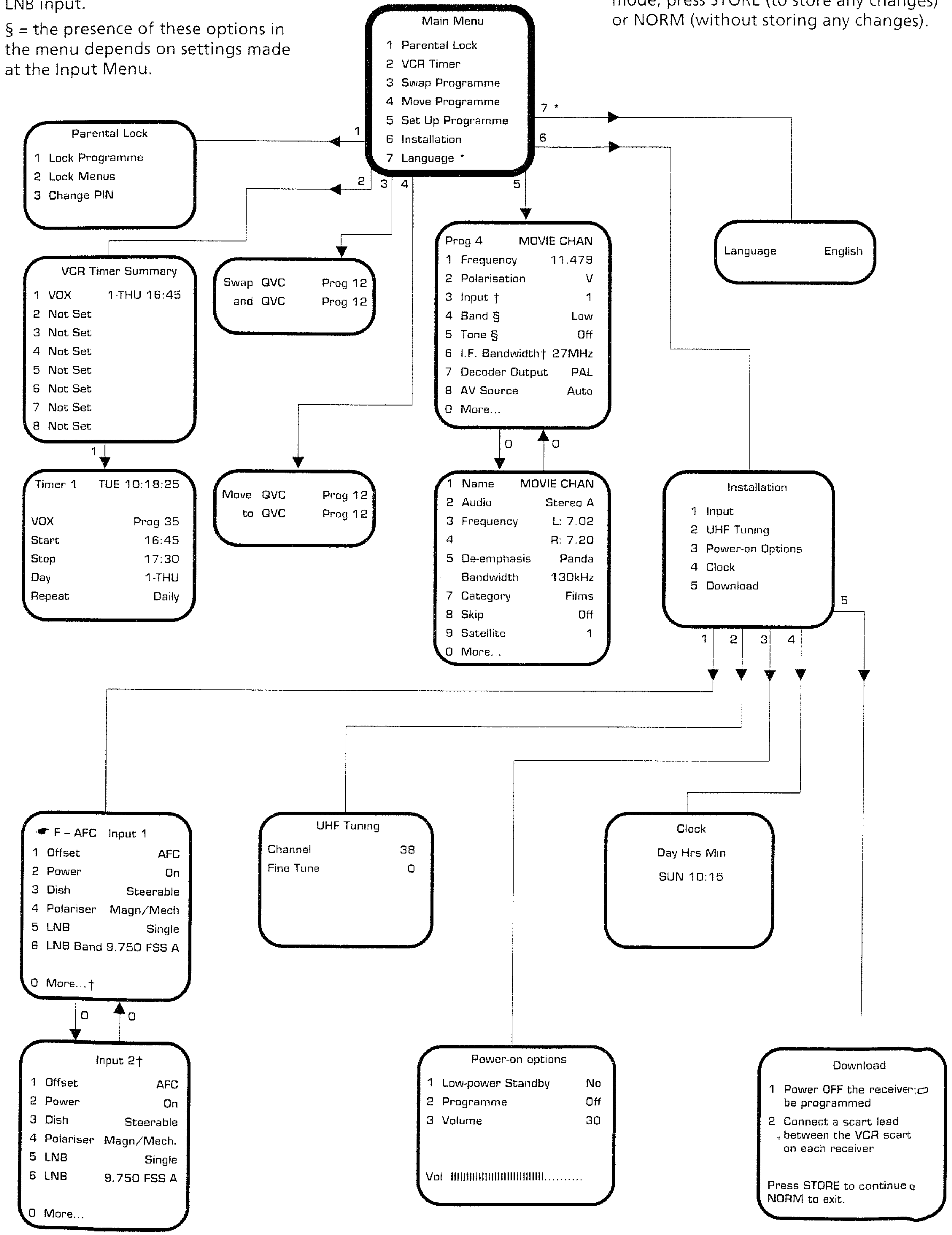
Menu Tree

* = absent for receivers with integral VideoCrypt decoder.

† = absent for receivers with a single LNB input.

§ = the presence of these options in the menu depends on settings made at the Input Menu.

Use the number keys to move down the menu tree and the MENU key to move back up it. To return to normal viewing mode, press STORE (to store any changes) or NORM (without storing any changes).


Main Menu
1 Parental Lock
2 VCR Timer
3 Swap Programme
4 Move Programme
5 Set Up Programme
6 Installation
7 Language *
Parental Lock
1 Lock Programme
2 Lock Menus
3 Change PIN
VCR Timer Summary
1 VOX 1-THU 16:45
2 Not Set
3 Not Set
4 Not Set
5 Not Set
6 Not Set
7 Not Set
8 Not Set
Timer 1 TUE 10:18:25
VOX Prog 35
Start 16:45
Stop 17:30
Day 1-THU
Repeat Daily
Swap QVC Prog 12
and QVC Prog 12
Move QVC Prog 12
to QVC Prog 12
Prog 4 MOVIE CHAN
1 Frequency 11.479
2 Polarisation V
3 Input † 1
4 Band § Low
5 Tone § Off
6 I.F. Bandwidth† 27MHz
7 Decoder Output PAL
8 AV Source Auto
0 More...
1 Name MOVIE CHAN
2 Audio Stereo A
3 Frequency L: 7.02
4 R: 7.20
5 De-emphasis Panda
Bandwidth 130kHz
7 Category Films
8 Skip Off
9 Satellite 1
0 More...
Language English
Installation
1 Input
2 UHF Tuning
3 Power-on Options
4 Clock
5 Download
F – AFC Input 1
1 Offset AFC
2 Power On
3 Dish Steerable
4 Polariser Magn/Mech
5 LNB Single
6 LNB Band 9.750 FSS A
0 More...†
Input 2†
1 Offset AFC
2 Power On
3 Dish Steerable
4 Polariser Magn/Mech.
5 LNB Single
6 LNB 9.750 FSS A
0 More...
UHF Tuning
Channel 38
Fine Tune 0
Clock
Day Hrs Min
SUN 10:15
Power-on options
1 Low-power Standby No
2 Programme Off
3 Volume 30
Vol
Download
1 Power OFF the receiver to be programmed
2 Connect a scart lead between the VCR scart on each receiver
Press STORE to continue or NORM to exit.
1
2
3
4
5
6
7 *
0
0

Gaining Access to the Unit

REMEMBER - SAFETY FIRST

⚠
WARNING
Before dismantling the unit always disconnect it from the mains supply.

⚠
WARNING
Remove your wrist strap before applying power to the re-assembled equipment to avoid potential shock hazards.

⚠
WARNING
The incorrect substitution of electrolytic capacitors may result in an explosion hazard.

⚠
Caution
Work on an earth mat and wear a wrist strap and earth lead to prevent electrostatic damage to components. Once the main board is removed from the casing it is fairly flexible, so handle it carefully to avoid damaging the components.

⚠
Caution
You must replace all the PCB fixings, screws etc. when the unit is re-assembled, otherwise there could be hazards due to reduced clearances.

⚠
Caution
Before you apply mains power to the unit, always ensure that the voltage rating stated on the rear panel of the unit matches the mains voltage supply in the country of installation.

⚠
Caution
Do not spray chemicals on or near the unit.

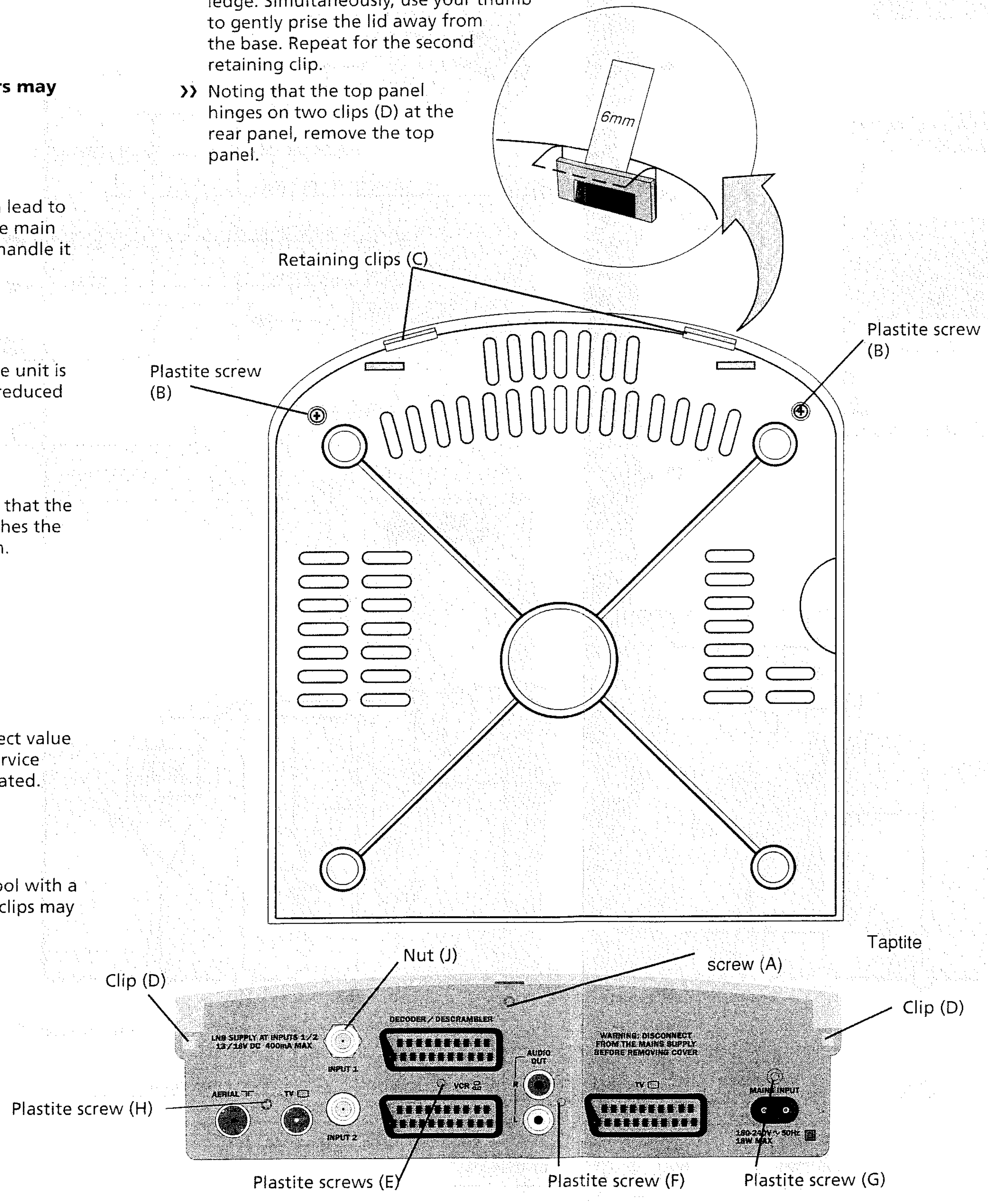
⚠
Caution
Replacements for faulty components must be of the correct value and rating and must be assembled by a competent service engineer, otherwise safety approvals could be invalidated.

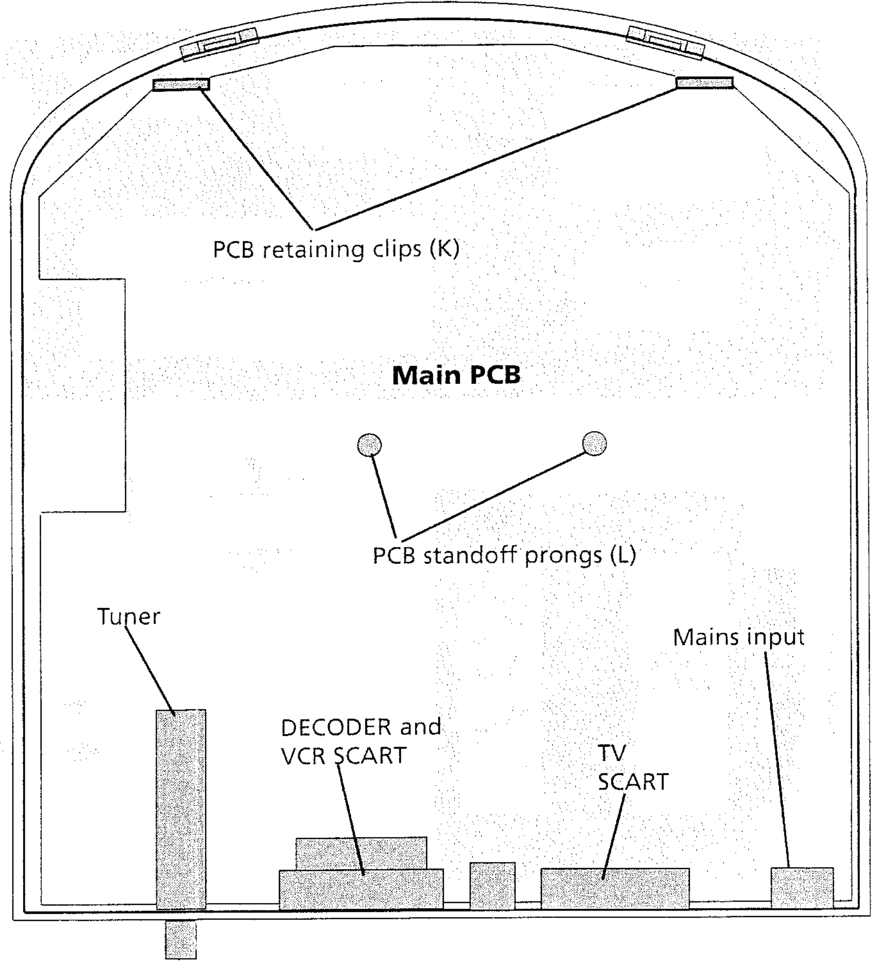
⚠
Caution
When releasing the retaining clips (C), use a flat bladed tool with a blade that has a minimum width of 6 mm, otherwise the clips may snap.

REMOVING THE TOP COVER

To remove the top cover:

- ›› Unscrew the taptite screw (A) at the rear of the unit.
- ›› Unscrew the two plastite screws (B) at the base of the unit.
- ›› At the first retaining clip (C) in the base of the unit, insert a flat bladed tool (the minimum blade width must be 6 mm) between the retaining clip and its corresponding ledge. Place your thumb in the groove that separates the lid and the base of the unit. **Gently twist** the flat bladed tool to unhook the plastic retaining clip from the chassis ledge. Simultaneously, use your thumb to gently prise the lid away from the base. Repeat for the second retaining clip.
- ›› Noting that the top panel hinges on two clips (D) at the rear panel, remove the top panel.


6mm
Retaining clips (C)
Plastite screw (B)
Plastite screw (B)
Nut (J)
Taptite screw (A)
Clip (D)
Clip (D)
LNB SUPPLY AT INPUTS 1/2 13/18V DC 400mA MAX
DECODER / DESCRAMBLER
INPUT 1
AERIAL
TV
INPUT 2
VCR
AUDIO OUT
WARNING: DISCONNECT FROM THE MAINS SUPPLY BEFORE REMOVING COVER
TV
MAINS INPUT
180-240V~ 50Hz 18W MAX
Plastite screw (H)
Plastite screws (E)
Plastite screw (F)
Plastite screw (G)


PCB retaining clips (K)
Main PCB
PCB standoff prongs (L)
Tuner
Mains input
DECODER and VCR SCART
TV SCART

REMOVING THE MAIN PCB

To remove the main PCB:

- ›› Unscrew the rear-panel screws (E, F, G and H). Use a nut runner to remove the nut (J) from the Input 1 connector.
- ›› Gently unclip the two PCB retaining clips (K) at the edge of the Main PCB.
- ›› To free the PCB, gently lift the front edge of the board. The PCB standoff prongs (L) (near the middle of the board) should release automatically. If not, crimp the tops of the standoff prongs and gently lift the front edge of the PCB again.
- ›› Gently lift the PCB away from the rear panel.

REFITTING THE MAIN PCB

To refit the main PCB:

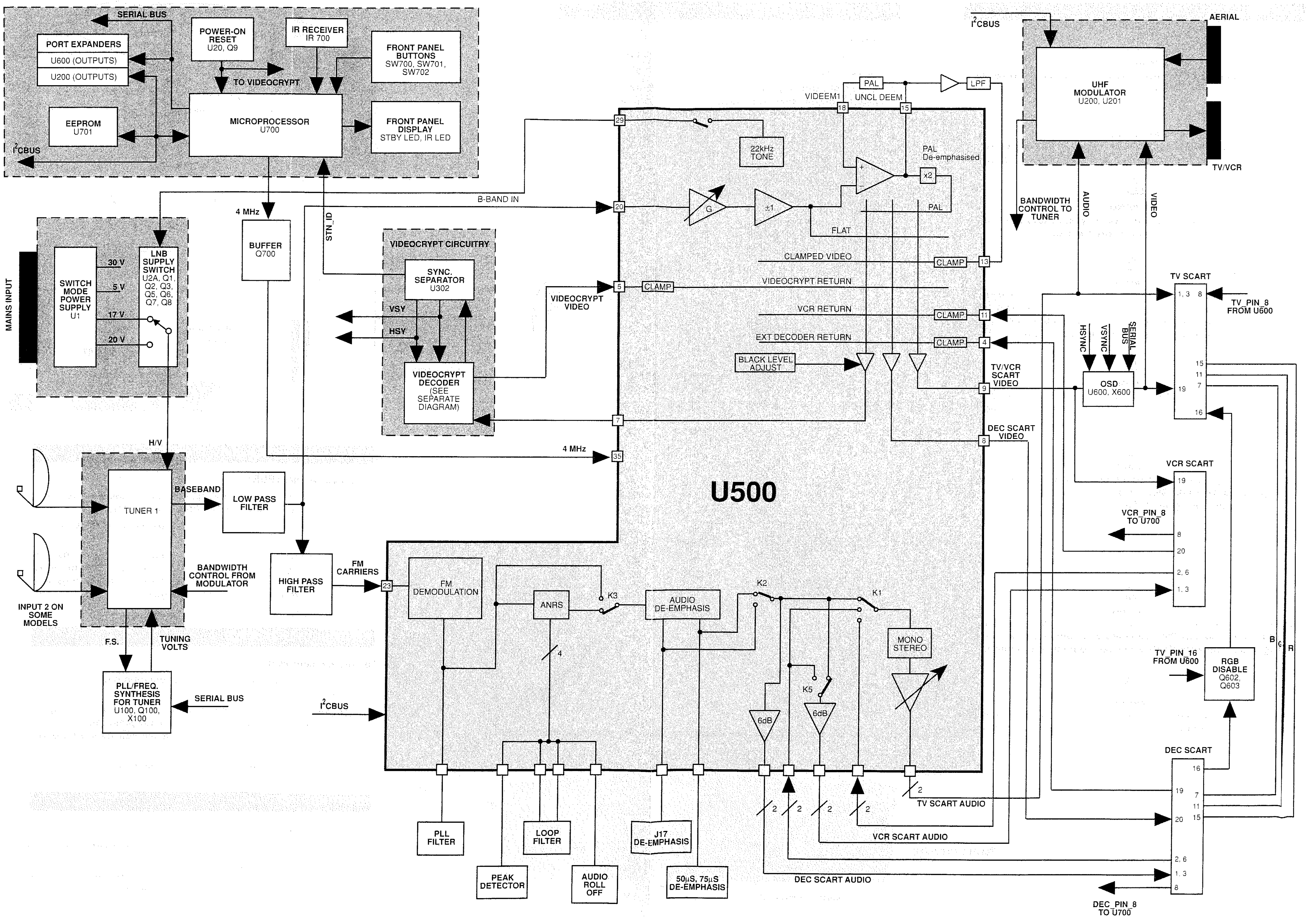
- ›› Gently insert the PCB under the four retaining plugs at the base of the rear panel.
- ›› Press the front edge of the PCB to clip the two PCB retaining clips (K) over the edge of the board. Gently press the centre of the Main PCB to ensure it is secured by the PCB standoff prongs (L).
- ›› Replace the rear-panel screws (E, F, G and H) and the nut (J) on the Input 1 connector.

REFITTING THE COVER

To refit the cover:

- ›› Insert the top panel clips (D) into their corresponding slots on the rear panel.
- ›› Press the top panel and base together until the retaining clips (C) click into place. Replace the screws (B) and (A).

Main Block Diagram

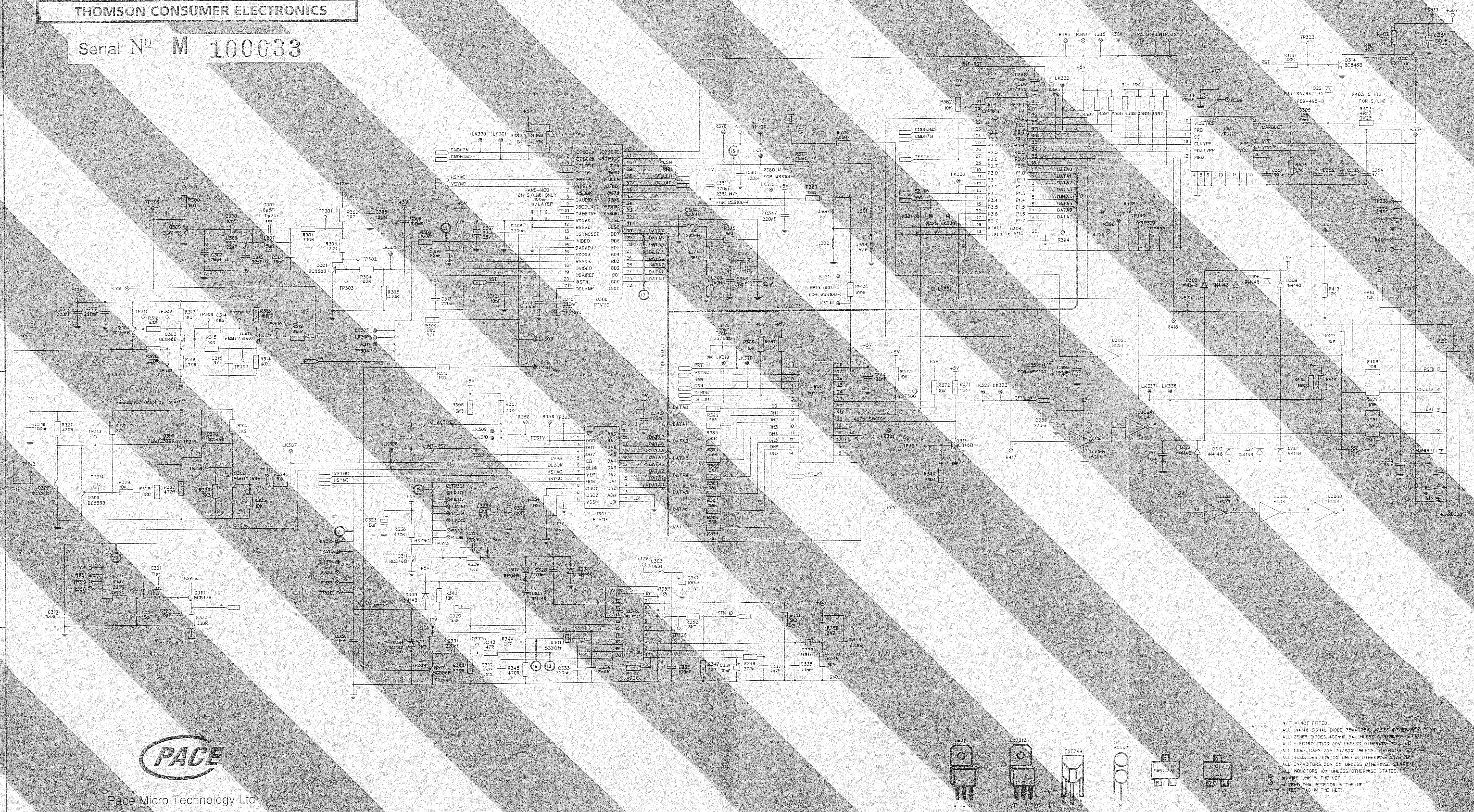

SERIAL BUS
PORT EXPANDERS
U600 (OUTPUTS)
U200 (OUTPUTS)
POWER-ON RESET U20, Q9
IR RECEIVER IR 700
FRONT PANEL BUTTONS SW700, SW701, SW702
TO VIDEOCRYPT
EEPROM U701
MICROPROCESSOR U700
FRONT PANEL DISPLAY STBY LED, IR LED
I²CBUS
MAINS INPUT
SWITCH MODE POWER SUPPLY U1
30 V
5 V
17 V
20 V
LNB SUPPLY SWITCH U2A, Q1, Q2, Q3, Q5, Q6, Q7, Q8
4 MHz
BUFFER Q700
STN_ID
B-BAND IN
VIDEOCRYPT CIRCUITRY
SYNC. SEPARATOR U302
VSY
HSY
VIDEOCRYPT DECODER (SEE SEPARATE DIAGRAM)
VIDEOCRYPT VIDEO
H/V
TUNER 1
BASEBAND
LOW PASS FILTER
INPUT 2 ON SOME MODELS
BANDWIDTH CONTROL FROM MODULATOR
F.S.
TUNING VOLTS
PLL/FREQ. SYNTHESIS FOR TUNER U100, Q100, X100
SERIAL BUS
HIGH PASS FILTER
FM CARRIERS
I²CBUS
29
20
5
7
35
23
22kHz TONE
G
±1
VIDEEM1
PAL
UNCL DEEM
18
15
LPF
PAL De-emphasised
x2
PAL
FLAT
CLAMPED VIDEO
CLAMP
13
CLAMP
VIDEOCRYPT RETURN
VCR RETURN
CLAMP
11
EXT DECODER RETURN
CLAMP
4
BLACK LEVEL ADJUST
TV/VCR SCART VIDEO
9
DEC SCART VIDEO
8
U500
FM DEMODULATION
ANRS
4
K3
AUDIO DE-EMPHASIS
K2
K1
MONO STEREO
K5
6dB
6dB
2
2
2
2
2
PLL FILTER
LOOP FILTER
PEAK DETECTOR
AUDIO ROLL OFF
J17 DE-EMPHASIS
50µS, 75µS DE-EMPHASIS
TV SCART AUDIO
VCR SCART AUDIO
DEC SCART AUDIO
I²CBUS
AERIAL
UHF MODULATOR U200, U201
TV/VCR
BANDWIDTH CONTROL TO TUNER
AUDIO
VIDEO
TV SCART
1, 3
8
TV_PIN_8 FROM U600
HSYNC
VSYNC
SERIAL BUS
OSD U600, X600
15
11
7
19
16
VCR SCART
19
VCR_PIN_8 TO U700
8
20
2, 6
1, 3
B
G
R
TV_PIN_16 FROM U600
RGB DISABLE Q602, Q603
DEC SCART
16
19
7
11
20
15
2, 6
1, 3
8
DEC_PIN_8 TO U700

WARNING

This circuit diagram is TCE's intellectual property and forms part of a confidentiality agreement and should not be disclosed to any third party without TCE's prior written agreement. Copy is strictly prohibited.

THOMSON CONSUMER ELECTRONICS

Serial № M 100033



6
5
4
3
2
1
D
C
B
A
U300 PTV110
U301 PTV114
U302 PTV117
U303 PTV112
U304 PTV115
U305 PTV113
U306C HC04
U306B HC04
U306A HC04
U306F HC04
U306E HC04
U306D HC04
Videocrypt Graphics insert
HAND-MOD ON S/LNB ONLY
X300 32MHz
X301 500KHz
CMDH7M
CMDH3M5
HSYNC
VSYNC
TESTV
INT-RST
VC_ACTIVE
VC_RST
AUTH_SWITCH
DATA[0:7]
CARDDET
CARD300
VCC
RST
CH3CLK
DAT
VPP
PPV
STN_ID
+5V
+12V
+30V
+5VFR
TIP31
LM7812
FXT749
BC547
BIPOLAR
FET
B C E
I/P O/P
E B

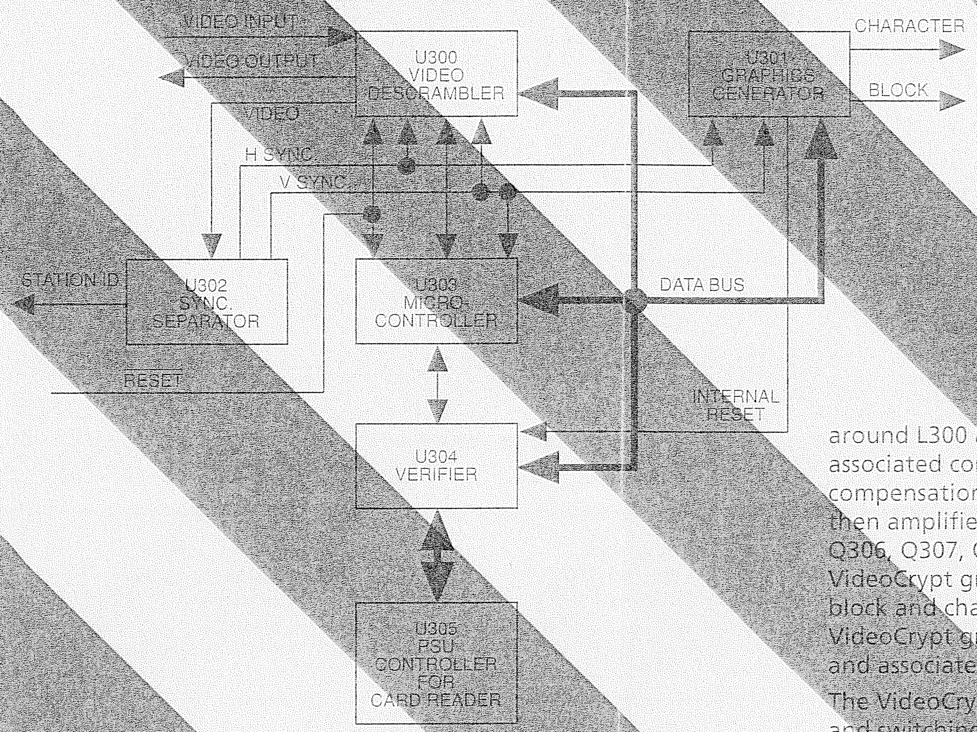
NOTES:
N/F = NOT FITTED
ALL 1N4148 SIGNAL DIODE 75MA 75V UNLESS OTHERWISE STAID
ALL ZENER DIODES 400mW 5% UNLESS OTHERWISE STATED.
ALL ELECTROLYTICS 50V UNLESS OTHERWISE STATED.
ALL 100nF CAPS 25V 20/80% UNLESS OTHERWISE STATED.
ALL RESISTORS 0.1W 5% UNLESS OTHERWISE STATED.
ALL CAPACITORS 50V 5% UNLESS OTHERWISE STATED.
ALL INDUCTORS 10% UNLESS OTHERIWSE STATED.
= WIRE LINK IN THE NET.
= ZERO OHM RESISTOR IN THE NET.
= TEST PAD IN THE NET.

PACE

Pace Micro Technology Ltd
Victoria Road • Shipley • BD18 3LF • England
Tel: +44 (0)274 532000 • Fax: +44 (0)274 532010

MSS 100-I SATELLITE RECEIVER - VIDEOCRYPT INFORMATION FOR SERVICE MANUAL (Manual Part No. 503-1000200)

VIDEOCRYPT BLOCK DIAGRAM AND CIRCUIT DESCRIPTION



Please see the main circuit diagram (separate sheet) and block diagram (page 14 of the Service Manual) as well as the diagrams on this sheet.

The video signal comes from the switching matrix U500 (on the main block diagram) which is controlled by U700. The video signal has a 2 V black level and is approximately 1.85 V pk to pk (sync. to bar). It is shown by the line labelled DEC OUT on the main circuit diagram and is applied via R306, to pin 14 of U300, the video descrambler (on the VideoCrypt circuit diagram).

The data on the video input at pin 14 of U300 is stripped by U300 and passes down the common data bus to U301, U303 and U304. U303 the microcontroller determines whether the video signal is scrambled and the line (VC_ACTIVE) emerging from pin 4 of U301 indicates this presence or absence of a VideoCrypt channel to the microprocessor U700 (on the main circuit diagram). R357 is a pull-up resistor on pin 4 of U301. When the micoprocessor U700 detects that VC_ACTIVE has gone high, it writes to the audio and video processor and switching matrix U500 via the I²C BUS and switches the VideoCrypt input (on pin 5 of U500) to the main video output (pin 9 of U500).

The video input to pin 14 of U300 emerges at pin 13 and passes via R310, Q312, C331, R343 to pin 19 of U302, the sync. separator. U302 uses ceramic resonator X301 to generate horizontal and vertical sync. pulses in the absence of a video signal. If there is a valid signal at pin 19 of U302, these sync. pulses are locked to this incoming video signal.

The sync. pulses (HSYNC and VSYNC at pins 12 and 15 respectively of U302) are needed by the graphics generator U600 (see page 16 of the Service Manual) and also by U301. VSYNC is needed by U303, the microcontroller IC. The presence of a valid video input at pin 19 of U302 causes the "station ID" line (STN_ID) at pin 7 to go high to show it has locked on to a programme. This line has various functions in the video circuitry - see the Service Manual.

The video input at pin 14 of U300 is digitised and descrambled before emerging at pin 18, where it is approximately 0.6 V pk to pk. It is fed via emitter follower Q301 into the reconstruction filter around L300 and L301. The signal is DC shifted to 2 V by Q300 and associated components. The signal then undergoes group delay compensation from Q302 and associated components. The signal is then amplified by Q303 and Q304 and associated components. Q305, Q306, Q307, Q308, Q309 and associated components control the VideoCrypt graphics insertion. Q306 and Q309 being controlled by the block and char lines from pins 6 and 5 respectively of U301, the VideoCrypt graphics generation IC. The video signal emerges via Q310 and associated components which form a 14 MHz trap.

The VideoCrypt video is then input to the audio and video processor and switching matrix U500 on pin 5. This VideoCrypt video signal will only be switched through to the main video output (pin 9 of U500) when the microprocessor detects that the VC_ACTIVE line has gone high.

As stated above, U301 generates the BLOCK and CHAR control lines to insert the graphics onto the outgoing video. R354 and C327 form a local oscillator which determines the size of the graphics and their position on the screen. To operate properly, U301 needs horizontal and vertical sync. pulses (at pins 8 and 7 respectively) from U302.

U304 is a verifier IC which controls the data and commands for the card reader via the card power supply controller U305. There is a reset line from pin 3 of U301 (R356 is a pull-up resistor) which enters U304 at pin 9 and resets U304 during a power-up.

The main clock is controlled by X300, a 28 MHz oscillator. This clock is divided BY U300 to give 7 MHz and 3.5 MHz which are required by U303 (3.5 MHz), U304 (7 MHz) and the card reader circuitry (both 7 MHz and 3.5 MHz).

As an aid to trouble shooting, you can force all the signals to pass through the VideoCrypt path by grounding link 309 or 310.

Sync Separator

The video signal which passes into the VideoCrypt circuitry is switched through U500 provided that pin 14 of U300 is low (i.e. internal video is selected). It is then buffered by Q312, AC coupled by C331 into pin 19 of U302, the sync. separator. U302 has a phase locked loop with a free running VCO which uses the ceramic resonator X301; if not locked, this generates free running horizontal (HSYNC) and vertical (VSYNC) sync. pulses.

If a valid video signal is detected at pin 19 of U302 then the horizontal and vertical sync. pulses are locked to the video; the line STN_ID emerging at pin 7 of U302 is a "station ID" line which goes high to 12 V (subsequently divided down to 5 V by R352 and R347) to show that the receiver has locked onto a signal (this line also controls other functions in the video circuitry).

The horizontal and vertical sync. pulses (on pins 12 and 15 respectively of U302 are needed for the VideoCrypt functions and are also fed to pins 18 and 19 respectively of U600, the colour graphics generator.

GRID REFERENCES FOR VIDEOCRYPT CIRCUIT DIAGRAM

* = not fitted

◊ = actually a zerohm link (in capacitor position)

CAPACITORS	
C300	C6
C301	C6
C302	C6
C303	C6
C304	C5
C305	C5
C306	C5
C307	C5
C308	C4
C309	C5
C310	C4
C311	C4
C312	C4
C313	C5
C314	C6
C315*	C6
C316	C6
C317	C6
C318	B6
C319	B6
C320	B6
C321	B6
C322	B6
C323	B5
C324	B5
C325*	B5
C326	B4
C327	B4
C328	B4
C329	B5
C330	A5
C331	A5
C332	A4
C333	A4
C334	A4
C335	A4
C336	A4
C337	A3
C338	A3
C339	A3
C340	A3
C341	B4
C342	B4
C343	C4
C344	B3
C345	C4
C346	C3
C347	C3
C348	D2
C349	D2
C350	A1
C351	C1
C352	C1
C353	C1
C354	C1
C355	B1
C356	B1
C357	B2
C358	B2
C359	C2
C360	
C361	C4
DIODES	
D300	B5
D301	A5
D302	B4
D303	B4
D304	B4
D305	C1
D306	C2
D307	C2
D308	C1
D309	C1
D310	B1
D311	B1
D312	B2
D313	B2
INDUCTORS	
L300	C6
L301	C5
L302	B6
L303	B4
L304	C4
L305	C4
L306	C4
LINKS	
J300*	C3
J301	C3
J302	C3
J303*	C3
LK300	C5
LK301	C4
LK302	C5
LK303	C4
LK304	C4
LK305	C5
LK306	C5
LK307	B5
LK308	B5
LK309	B5
LK310	B5
LK311	B5
LK312	B5
LK313	B5
LK314	B5
LK315	B5
LK316	B5
LK317	B5
LK318	B5
LK319	C4
LK320	C3
LK321	B3
LK322	B3
LK323	B2
LK324	C3
LK325	C3
LK326	C3
LK327	C3
LK328	C3
LK329	C3
LK330	C3
LK331	C3
LK332	D2
LK333	D1
LK334	C1
LK335	C1
LK336	B2
LK337	B2
TRANSISTORS	
Q300	C6
Q301	C5
Q302	C5
Q303	C6
Q304	C6
Q305	B6
Q306	B6
Q307	B6
Q308	B6
Q309	B6
Q310	B6
Q311	B5
Q312	A5
Q313	B3
Q314	D1
Q315	D1
RESISTORS	
R300	C6
R301	C5
R302	C5
R303	C5
R304	C5
R305	C5
R306	C5
R307	C4
R308	C4
R309*	C5
R310	C5
R311	C5
R312	C5
R313	C5
R314	C5
R315	C6
R316	C6
R317	C6
R318	C6
R319	C6
R320	C6
R321	B6
R322	B6
R323	B6
R324	B5
R325	B5
R326	B6
R327	B6
R328	B6
R329	B6
R330	A6
R331	A6
R332	B6
R333	B6
R334	B5
R335	B5
R336	B5
R336	B5
R337	B5
R338	B5
R339	B5
R340	B5
R341	A5
R342	A5
R343	A4
R344	A4
R345	A4
R346	A4
R347	A4
R348	A3
R349	A3
R350	A3
R351	B3
R352	B4
R353	B4
R354	B4
R355	B5
R356	B5
R357	B4
R358	B4
R359	B4
R360	C3
R361	C3
R362	B4
R363	B4
R364	B4
R365	B4
R366	B4
R367	B4
R368	B4
R369	B4
R370	B3
R371	B3
R372	B3
R373	B3
R374	C4
R375	C4
R376	C4
R377	C3
R378	C3
R379	C3
R380	C3
R381	C3
R382	D3
R383	D2
R384	D2
R385	D2
R386	D2
R387	D2
R388	D2
R389	D2
R390	D2
R391	D2
R392	D2
R393	D2
R394	C2
R395	C2
R396	C2
R397	C2
R398	C2
R399	D2
R400	D1
R401	D1
R402	D1
R403	C1
R404	C1
R405	C1
R406	C1
R407	C1
R408	C1
R409	C1
R410	B1
R411	B1
R412	C1
R413	C1
R414	B1
R415	B1
R416	C2
R417	B2
R418	C1
R813	C3
ICS	
U300	C4
U301	B4
U302	B4
U303	B3
U304	C2
U305	C2
U306A	B2
U306B	B2
U306C	C2
U306D	B1
U306E	B1
U306F	B2
MISC. COMPONENTS	
CARD300	B1
TST300	B3
X300	C4
X301	A4

Interconnections

NOTE: Grid references preceded by V are on the VideoCrypt diagram. Those with no prefix are on the main circuit diagram.

WITHIN VIDEOCRYPT CIRCUIT	
CMD3M5	VC3, VC5
CMD7M	VC3, VC5
CSN	VB4, VC4
OFLDH1	VB4, VC4
OFULLN	VB2, VC4
RNN	VC3, VB4, VC4
SENDN	VB4, VC3
BETWEEN VIDEOCRYPT CIRCUIT AND MAIN CIRCUIT	
INT-RST	VD3, VB5, A3
VC_ACTIVE	VB5, A5, A5
HSYNC	VB5, VC5, B5, D4
STN_ID	VB3, A5, D4
RST	VC4, VC5, VD1, A5, B2
B	VC5, B4
A	VB6, B4
VC_RST	VB3, A5
TESTV	VB4, VC3, D3
VSYNC	VB4, VB5, VC5, B5, D4
PPV	VB3, A5

CARD READER DESCRIPTION

The 3.5 MHz clock to the cards (C3CLK) is buffered by U306C before being applied to the card. The line to pin 2 of CARD 300 is not used.

When a card is inserted into the card reader, pin 17 of U305 is pulled high to indicate the presence of a card (the CARDDET line).

If U305 detects the presence of a card and verifier U304 determines that the card needs to be addressed, then a data line from U304 commands U305 to apply power (VCC and VPP) to the card.

VCC goes to 5 V and is applied to the card. VPP is also initially 5 V and passes to the card, but U305 ensures that VPP cannot be at the card unless VCC is also present.

Data and clock should also be present at the cards before communication can take place. Diodes D306 to D313 provide protection for the control lines RSTN, DATA, C3CLK and C4 to keep them in the range 0 to 5 V.

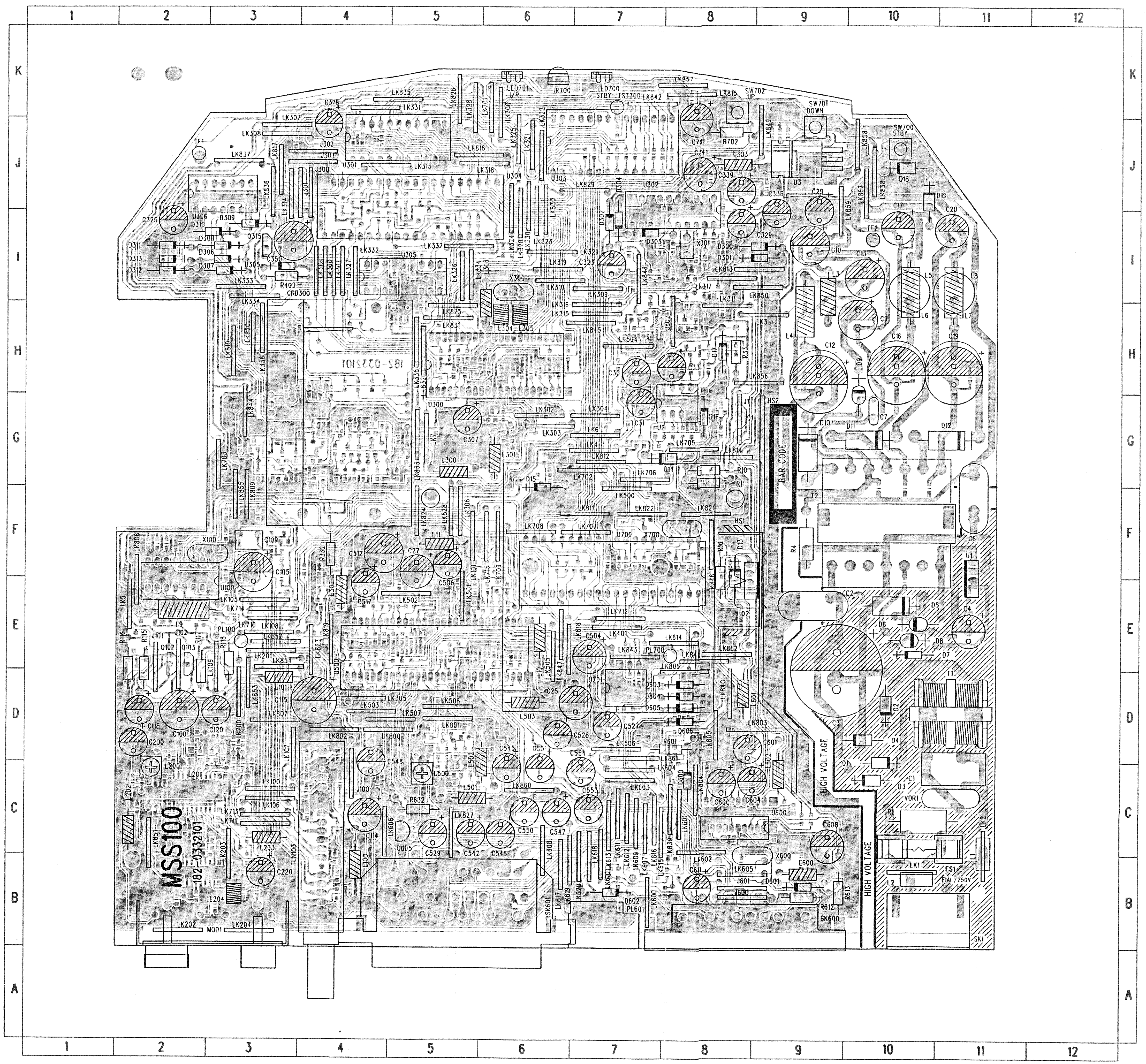
Main Board Ident - Grid References

† = Component on copper side of PCB.

* = Component not fitted.

RESISTORS	
R1	C10
R2	E11 †
R3	E10 †
R4	F9
R5	F10 †
R6	F10 †
R7	I11 †
R8	F10 †
R9	I9 †
R10	G8
R11	G8
R12	G8 †
R13	H8 †
R14	H8 †
R15	G8 †
R16	F8
R17	E8 †
R18	G7 †
R19	G8 †
R20	G7 †
R21	F6 †
R22	G6 †
R23	G6 †
R24	G8 †
R25	G8 †
R26	H7 †
R27	G7 †
R28	G7 †
R29	G7 †
R30	F7 †
R31	G8 †
R32	G7 †
R33	H8
R34	H8 †
R35	H8 †
R36	H8 †
R37	H8 †
R38	H8 †
R39	H8 †
R40	E8 †
R41	F2 †
R42	F2 †
R43	G7 †
R44	E11 †
R100	E3 †
R101	D3 †
R102	F2 †
R103	E7 †
R104	F3 †
R105	F3 †
R106	F3 †
R107	E3 †
R108	C4 †
R109	E3 †
R110	C4 †
R111	C4 †
R112	C3 †
R113	B4 †
R114	B4 †
R115	E2
R116	E2
R117	D2
R118	E3
R119	E2 †
R120	E3 †
R121	E2 †
R122	D3 †
R123	E2 †
R355	G7 †
R356	J5 †
R357	J5 †
R358	J3 †
R359	I4 †
R360	J5 †
R361	I6 †
R362	J7 †
R363	J7 †
R364	J7 †
R365	J7 †
R366	J7 †
R367	J7 †
R368	J7 †
R369	J8 †
R370	F7 †
R371	F6 †
R372	J4 †
R373	J7 †
R374	I6 †
R375	H6 †
R376	H4 †
R377	H5 †
R378	I3 †
R379	H5 †
R380	H5 †
R381	J3 †
R382	J4 †
R383	I4 †
R384	J4 †
R385	I4 †
R386	H5 †
R387	J4 †
R388	I5 †
R389	I5 †
R390	I5 †
R391	I5 †
R392	I5 †
R393	I5 †
R394	J4 †
R395	J5 †
R396	I4 †
R397	I5 †
R398	I5 †
R399	H5 †
R400	H3 †
R401	I3 †
R402	I3 †
R403	I3
R404	I3 †
R405	G5 †
R406	H4 †
R407	H4 †
R408	H4 †
R409	H4 †
R410	H3 †
R411	H4 †
R412	H4 †
R413	H4 †
R414	H4 †
R415	H4 †
R416	I3 †
R417	J3 †
R418	G5 †
R500	F6 †
R501	E6 †
R502	E6 †
R503	E6 †
R504	F6 †
R505	E5 †
R506	E5 †
R507	E5 †
R508	E5 †
R509	E5 †
R510	E5 †
R511	E5 †
R704	J9 †
R705	J9 †
R706	F7 †
R707	F7 †
R708	E7 †
R709	E7 †
R800	B8 †
R801	G4 †
R802	F7 †
R803	H6 †
R804	I5 †
R805	I5 †
R806	J3 †
R807	G4 †
R808	D5 †
R809	G5 †
R810	J4 †
R811	I5 †
R812	D4 †
R813	J6 †
CAPACITORS	
C1	C10
C2	E9
C3	E9
C4	E11
C5	E11 †
C6	F11
C7	G10
C8	H10 †
C9	H10
C10	I9
C11	H9 †
C12	H9
C13	I10
C14	H10 †
C15	I10 †
C16	H10
C17	I10
C18	H11 †
C19	H11
C20	I11
C21	G8 †
C22	G8 †
C23	G8 †
C24	D6 †
C25	D7
C26	F5 †
C27	F5
C28	J9 †
C29	I9
C30	H7
C31	G7
C32	G7 †
C33	H8
C34	F2 †
C100	D2
C101	C4 †
C102	F3 †
C103	F3 †
C104	E3 †
C105	F3
C106	C4 †
C107	C4 †
C108	E3 †
C109	F3
C110	F3 †
C111	F3 †
C112	B4 †
C113	B4 †
C114	C4
C115	D4
C116	C4 †
C117	B4 †
C118	D2
C119	B4 †
C120	D3
C350	I3
C351	I4 †
C352	H5 †
C353	H3 †
C354	G5 †
C355	I4 †
C356	I2 †
C357	I2 †
C358	J3 †
C359	I3 †
C360	H5 †
C361	I6 †
C500	F6 †
C501	E6 †
C502	E6 †
C503	E5 †
C504	E7
C505	F5 †
C506	F5
C507	E5 †
C508	E5 †
C509	E5 †
C510	E5 †
C511	E5 †
C512	F4
C513	E5 †
C514	E5 †
C515	E5 †
C516	E4 †
C517	E4
C518	E5 †
C519	E4 †
C520	E4 †
C521	E4 †
C522	E4 †
C523	E4 †
C524	E4 †
C525	E5 †
C526	E4 †
C527	D7
C528	D6
C529	C5
C530	D5 †
C531	C5 †
C532	D5 †
C534	C5 †
C535	C6 †
C536	C5 †
C537	C5 †
C538	C6 †
C539	C6 †
C540	C6 †
C541	E5 †
C542	C5
C543	C5 †
C544	E5 †
C545	C6
C546	C6
C547	C6
C548	D4
C549	E6 †
C550	C6
C551	C6
C552	E6 †
C553	C7
C554	C7
C555	D6 †
C556	E6 †
C557	D4 †
C558	E4 †
C600	C8
C601	D8
C602	D8 †
C603	B9 †
C604	C8
C605	C8 †
U301	J5
U302	J8
U303	J7
U304	J5
U305	I5
U306	J3
U500	E5
U600	C8
U700	F7
U701	D7
DIODES	
D1	D10
D2	D10
D3	C10
D4	D10
D5	E10
D6	E10
D7	E10
D8	E10
D9	G10
D10	G9
D11	G10
D12	G11
D13	F8
D14	G8
D15	F6
D16	G8
D17	H8
D18	J10
D19	J10
D200	C2 †
D300	I9
D301	I9
D302	I7
D303	I7
D304	I7
D305	I3
D306	I3
D307	I3
D308	I3
D309	I3
D310	I3
D311	I2
D312	I2
D313	I2
D600	C8
D601	B9
D602	B7
D603	D8
D604	D8
D605	D8
D606	D8
INDUCTORS	
L1	C11
L2	B10
L3	I9
L4	H9
L5	I10
L6	I10
L7	I11
L8	I11
L9	E2
L10	E6
L11	F5
L100	B4
L101	D3
L200	C2
L201	C2
L202	C2
L203	C3
L204	B3
L300	G5
L301	G6
L302	E4
L303	J8
L304	H6
LK332	I4
LK333	I3
LK334	I3
LK335	H5
LK336	H3
LK337	I5
LK401	E7
LK500	F7
LK501	E5
LK502	E5
LK503	D4
LK504	H7
LK505	E6
LK506	D7
LK507	D5
LK508	D5
LK600	B7
LK601	C8
LK602	C8
LK603	C7
LK604	C7
LK605	B8
LK606	C4
LK607	C7
LK608	C6
LK609	C7
LK610	C7
LK611	C7
LK612	C7
LK613	C7
LK614	E8
LK615	C7
LK616	C7
LK617	B6
LK618	B7
LK619	B6
LK620	B7
LK700	K6
LK701	K6
LK702	G7
LK703	G3
LK705	G8
LK706	G7
LK707	F7
LK708	F6
LK709	F6
LK710	E3
LK711	C3
LK712	E7
LK713	C3
LK714	E3
LK715	F6
LK800	D4
LK801	D5
LK802	D4
LK803	D8
LK804	C8
LK805	D8
LK806	D8
LK807	D3
LK808	E2
LK809	F3
LK810	H3
LK811	F7
LK812	G7
LK813	I9
LK814	G8
LK815	K8
LK816	J5
LK817	J3
LK818	E6
LK819	E4
LK820	H3
LK821	F8
LK822	F7
LK823	E4

Main Board Ident Diagram - Component Side



R44	E11 †
R100	E3 †
R101	D3 †
R102	F2 †
R103	E7 †
R104	F3 †
R105	F3 †
R106	F3 †
R107	E3 †
R108	C4 †
R109	E3 †
R110	C4 †
R111	C4 †
R112	C3 †
R113	B4 †
R114	B4 †
R115	E2
R116	E2
R117	D2
R118	E3
R119	E2 †
R120	E3 †
R121	E2 †
R122	D3 †
R123	E2 †
R124	E2 †
R125	E2 †
R126	F4 †
R127	E2 †
R200	C2 †
R201	C2 †
R202	C2 †
R203	D2 †
R204	D2 †
R205	D3 †
R206	D3 †
R207	D3 †
R208	C3 †
R210	B3 †
R211	C3 †
R212	B2 †
R213	C2 †
R214	C2 †
R215	C2 †
R216	B3 †
R217	B2 †
R218	B3 †
R219	B2 †
R220	B3 †
R300	G4 †
R301	G6 †
R302	G6 †
R303	G6 †
R304	G6 †
R305	G6 †
R306	G6 †
R307	H5 †
R308	H5 †
R309	G6 †
R310	H7 †
R311	G6 †
R312	G4 †
R313	G4 †
R314	G4 †
R315	G4 †
R316	G5 †
R317	G4 †
R318	G4 †
R319	G4 †
R320	G4 †
R321	G4 †
R322	G4 †
R323	G3 †
R324	G3 †
R325	G3 †
R326	G3 †
R327	G3 †
R328	G4 †
R329	G4 †
R330	G4 †
R331	F4 †
R332	F4
R333	E4 †
R334	H5 †
R335	H5 †

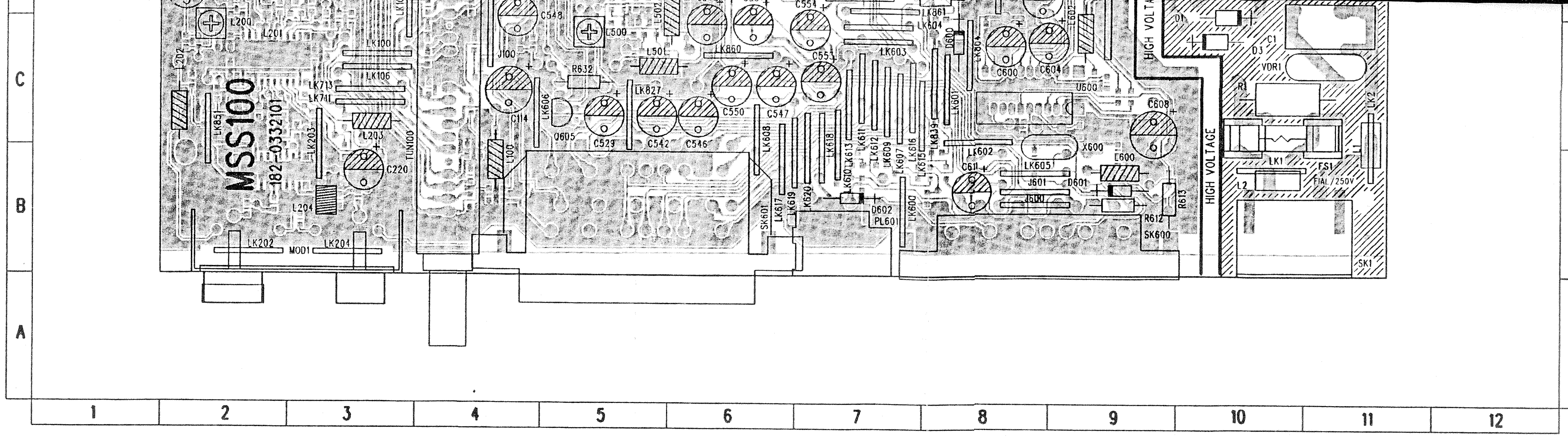
R406	H4 †
R407	H4 †
R408	H4 †
R409	H4 †
R410	H3 †
R411	H4 †
R412	H4 †
R413	H4 †
R414	H4 †
R415	H4 †
R416	I3 †
R417	J3 †
R418	G5 †
R500	F6 †
R501	E6 †
R502	E6 †
R503	E6 †
R504	F6 †
R505	E5 †
R506	E5 †
R507	E5 †
R508	E5 †
R509	E5 †
R510	E5 †
R511	E5 †
R512	E5 †
R513	E5 †
R514	E4 †
R515	E5 †
R516	E4 †
R517	E4 †
R518	E4 †
R519	E4 †
R520	E4 †
R521	D4 †
R522	E4 †
R523	E4 †
R524	E4 †
R525	C5 †
R526	D5 †
R527	C5 †
R528	C5 †
R529	C5 †
R530	C5 †
R531	C5 †
R532	D5 †
R533	E5 †
R534	E5 †
R535	D5 †
R536	D6 †
R537	E5 †
R538	E6 †
R539	E6 †
R540	E6 †
R541	E6 †
R542	D4 †
R543	E4 †
R600	D8 †
R601	D8
R602	B7 †
R603	C8 †
R604	C8 †
R605	C9 †
R606	C9 †
R607	B8 †
R608	B7 †
R609	B7 †
R610	B9 †
R611	B8 †
R612	B9
R613	B9
R614	B8 †
R615	B8 †
R616	B7 †
R617	C4 †
R618	C5 †
R619	B7 †
R620	D8 †
R621	D7 †
R622	B4 †
R623	D8 †
R624	D7 †
R625	E7 †
R626	D8 †
R627	D8 †

C31	G7
C32	G7 †
C33	H8
C34	F2 †
C100	D2
C101	C4 †
C102	F3 †
C103	F3 †
C104	E3 †
C105	F3
C106	C4 †
C107	C4 †
C108	E3 †
C109	F3
C110	F3 †
C111	F3 †
C112	B4 †
C113	B4 †
C114	C4
C115	D4
C116	C4 †
C117	B4 †
C118	D2
C119	B4 †
C120	D3
C121	F3 †
C200	D2
C201	C2 †
C202	C2 †
C203	C2 †
C204	D3 †
C205	C2 †
C206	C3 †
C207	D3 †
C208	D3 †
C209	C3 †
C210	C3 †
C211	C2 †
C212	C2 †
C213	C2 †
C214	C2 †
C215	C2 †
C216	C2 †
C217	C2 †
C218	B3 †
C219	C3 †
C220	B3
C221	B2 †
C222	B3 †
C223	B3 †
C224	B3 †
C225	B2 †
C226	C3 †
C227	B2 †
C300	G5 †
C301	G6 †
C302	G5 †
C303	G5 †
C304	G6 †
C305	G6 †
C306	H6 †
C307	G5
C308	H6 †
C309	H6 †
C310	H6 †
C311	H6 †
C312	H6 †
C313	H6 †
C314	G4 †
C315	G4 †
C316	G4 †
C317	G5 †
C318	G3 †
C319	G4 †
C320	F4 †
C321	E4 †
C322	E4 †
C323	I7
C324	I7 †
C325	I2
C326	J4
C327	J4 †
C328	I7 †
C329	I8
C330	H6 †

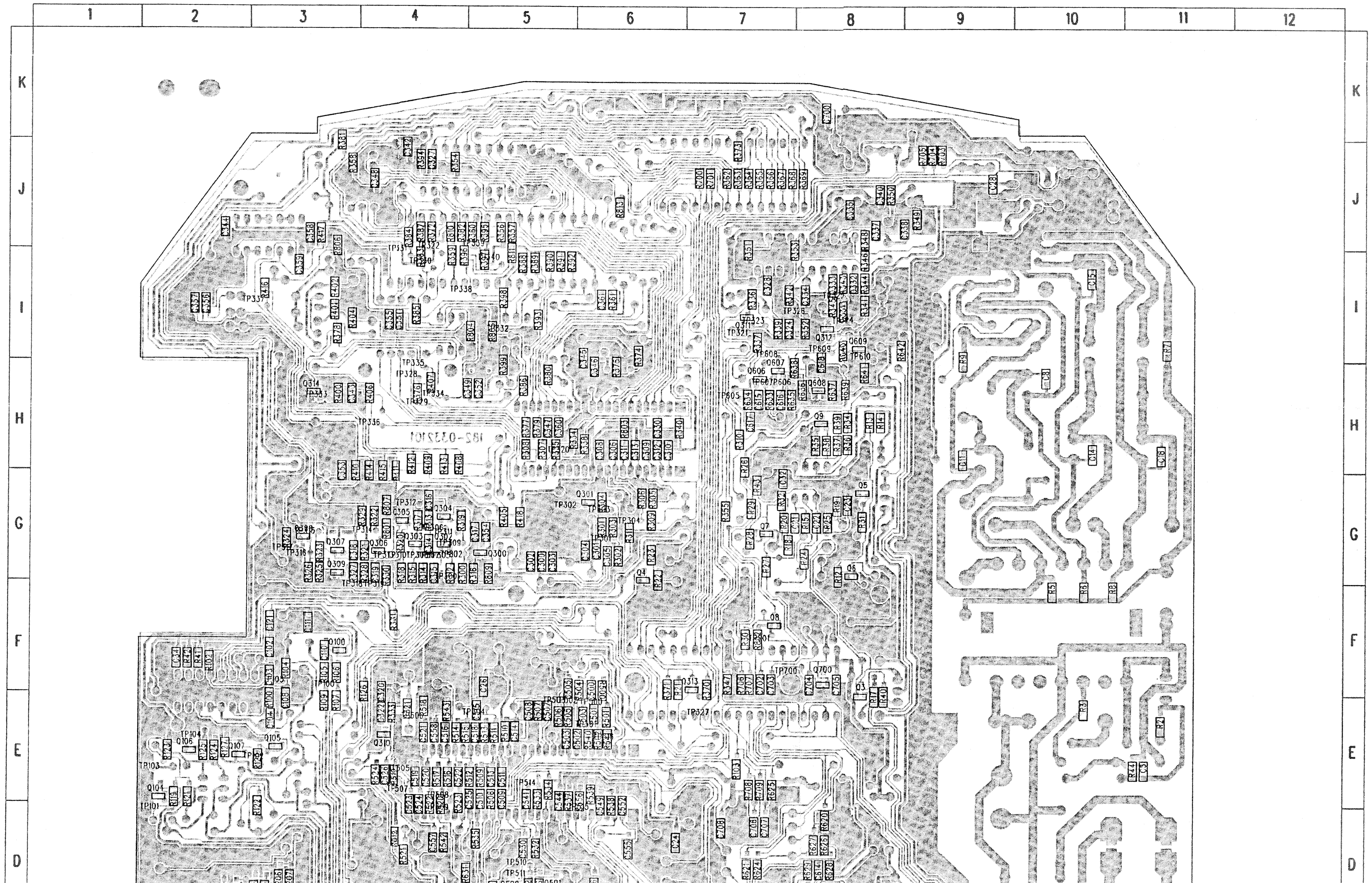
C540	C6 †
C541	E5 †
C542	C5
C543	C5 †
C544	E5 †
C545	C6
C546	C6
C547	C6
C548	D4
C549	E6 †
C550	C6
C551	C6
C552	E6 †
C553	C7
C554	C7
C555	D6 †
C556	E6 †
C557	D4 †
C558	E4 †
C600	C8
C601	D8
C602	D8 †
C603	B9 †
C604	C8
C605	C8 †
C606	B9 †
C607	C9 †
C608	C9
C609	C9 †
C610	C9 †
C611	B8
C612	C4 †
C613	B4 †
C614	D8 †
C615	H7 †
C616	H7 †
C617	H7 †
C618	I8 †
C700	K8 †
C701	J8
C702	F7 †
C703	F7 †
C704	F8 †
C705	F8 †
C706	D7 †
C707	D7 †
C708	D7 †
TRANSISTORS	
Q1	G8
Q2	E8
Q3	E8 †
Q4	G6 †
Q5	G8 †
Q6	G8 †
Q7	G7 †
Q8	F7 †
Q9	H8 †
Q100	F3 †
Q101	C4 †
Q102	E2
Q103	E2
Q104	E2 †
Q105	E3 †
Q106	E2 †
Q107	E2 †
Q200	C3 †
Q300	G5 †
Q301	G6 †
Q302	G4 †
Q303	G4 †
Q304	G4 †
Q305	G4 †
Q306	G4 †
Q307	G3 †
Q308	G3 †
Q309	G3 †
Q310	E4 †
Q311	I7 †
Q312	I8 †
Q313	F7 †
Q314	H3 †
Q315	I3
Q500	D5 †
Q501	D5 †
Q502	C5 †

D606	D8
INDUCTORS	
L1	C11
L2	B10
L3	I9
L4	H9
L5	I10
L6	I10
L7	I11
L8	I11
L9	E2
L10	E6
L11	F5
L100	B4
L101	D3
L200	C2
L201	C2
L202	C2
L203	C3
L204	B3
L300	G5
L301	G6
L302	E4
L303	J8
L304	H6
L305	H6
L306	H6
L500	C5
L501	C5
L502	D6
L503	D6
L600	B9
L601	D8
L602	C9
CONNECTORS	
SK1	B10
SK600	B8
SK601	B5
PL100	E3
PL601	B7
PL700	E8
LINKS	
J1	G8
J100	C4
J101	E2
J102	E2
J300	J4
J301	J3
J302	J4
J303	J4
J600	B8
J601	B8
J602	H8
LK1	B10
LK2	C11
LK3	H9
LK4	G7
LK5	E2
LK6	G7
LK7	G5
LK100	C3
LK101	F5
LK105	E3
LK106	C3
LK107	D3
LK108	E3
LK109	E3
LK200	D3
LK201	E3
LK202	B2
LK203	C3
LK204	B3
LK300	I4
LK301	I4
LK302	G6
LK303	G6
LK304	G7
LK305	D4
LK306	F5
LK307	J3
LK308	J3
LK309	I7
LK310	I6
LK311	H8
LK312	I4

LK715	F6
LK800	D4
LK801	D5
LK802	D4
LK803	D8
LK804	C8
LK805	D8
LK806	D8
LK807	D3
LK808	E2
LK809	F3
LK810	H3
LK811	F7
LK812	G7
LK813	I9
LK814	G8
LK815	K8
LK816	J5
LK817	J3
LK818	E6
LK819	E4
LK820	H3
LK821	F8
LK822	F7
LK823	E4
LK824	F5
LK825	H5
LK826	K5
LK827	C5
LK828	F5
LK829	J7
LK830	J6
LK831	H5
LK832	H5
LK833	G5
LK834	I5
LK835	K5
LK836	J3
LK837	J3
LK838	J10
LK839	C8
LK840	D8
LK841	E8
LK842	K7
LK843	E7
LK844	G3
LK845	H7
LK846	F8
LK847	E6
LK848	I7
LK849	J9
LK850	I9
LK851	C2
LK852	E3
LK853	D3
LK854	E3
LK855	F3
LK856	H9
LK857	K8
LK858	J10
LK859	I9
LK860	C6
LK861	D7
LK862	E8
LK863	J10
MISC COMPONENTS	
CRD300	G4
FS1	C10
HS1	E8
HS2	E9
IR700	K6
LED700	K7
LED701	K6
MOD1	B3
SW700	J10
SW701	J9
SW702	K8
T1	D11
T2	F10
TF1	J2
TF2	I10
TST300	K7
TUN100	C4
VDR1	C11

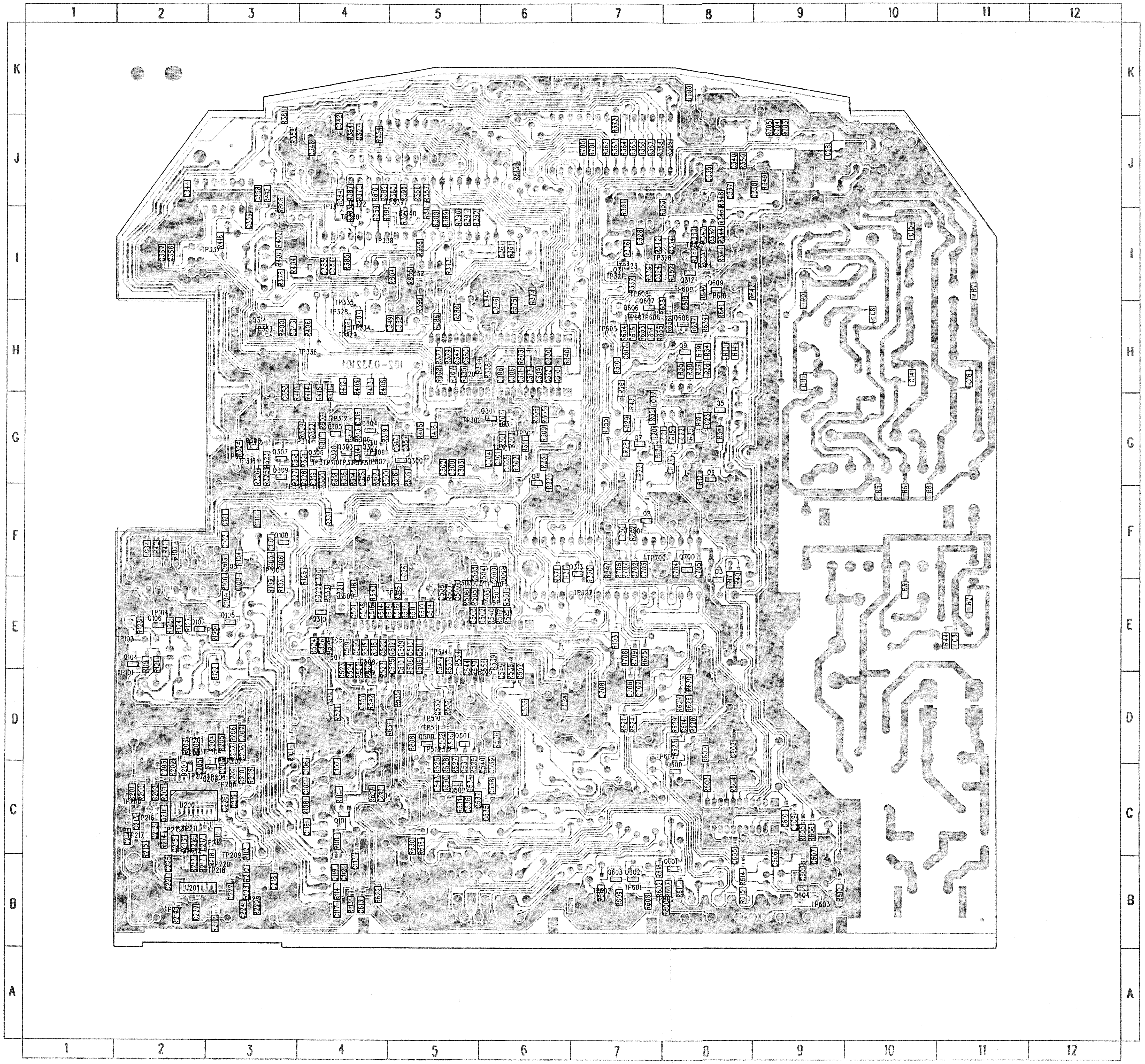


Main Board Ident Diagram - Surface Mount Side

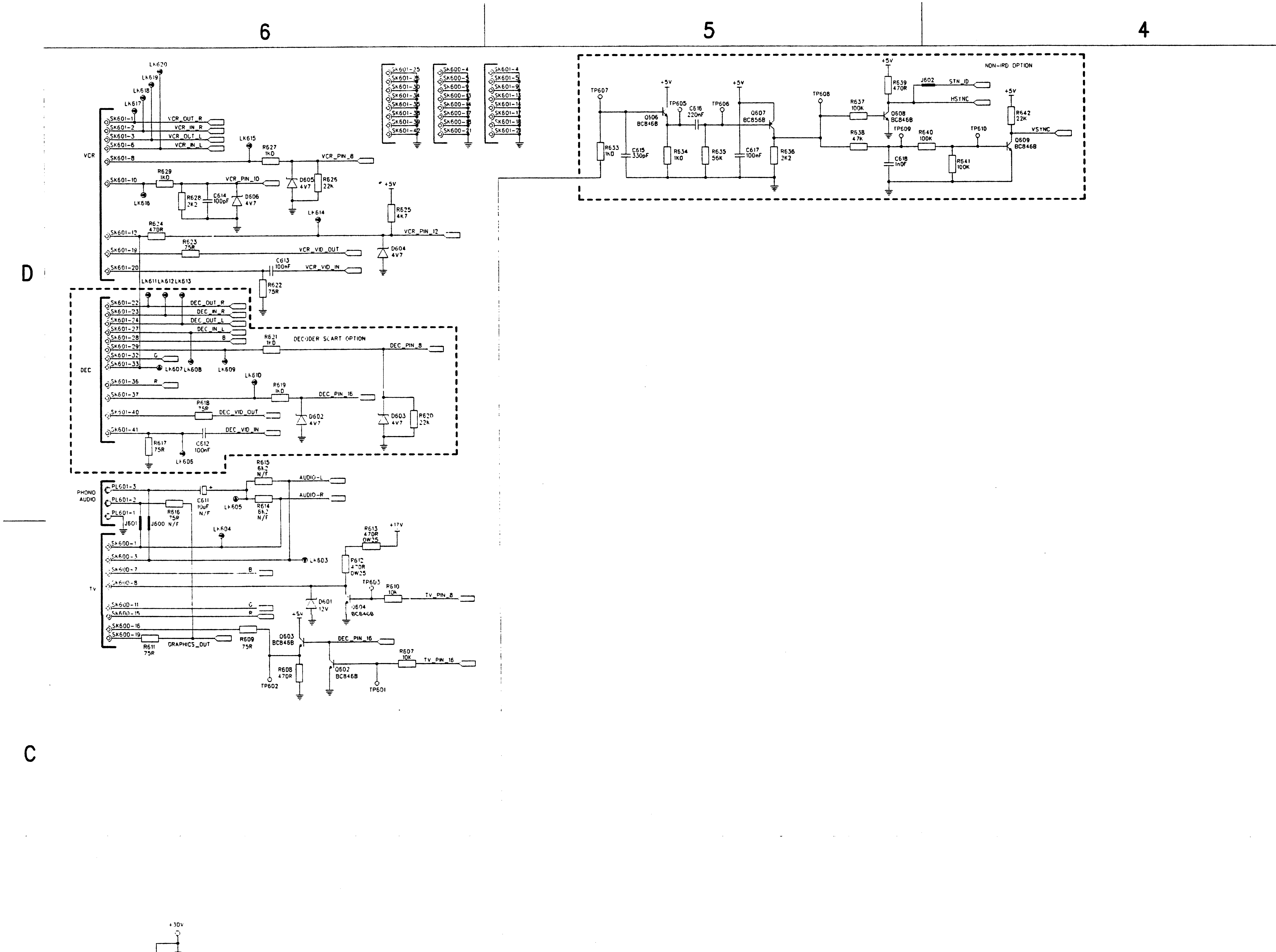


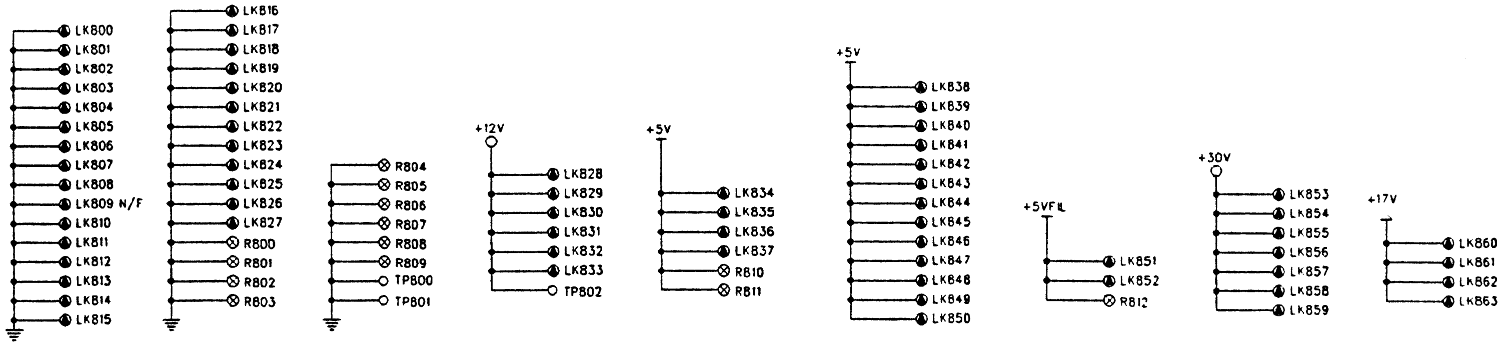
Main Board Ident Diagram - Surface Mount Side

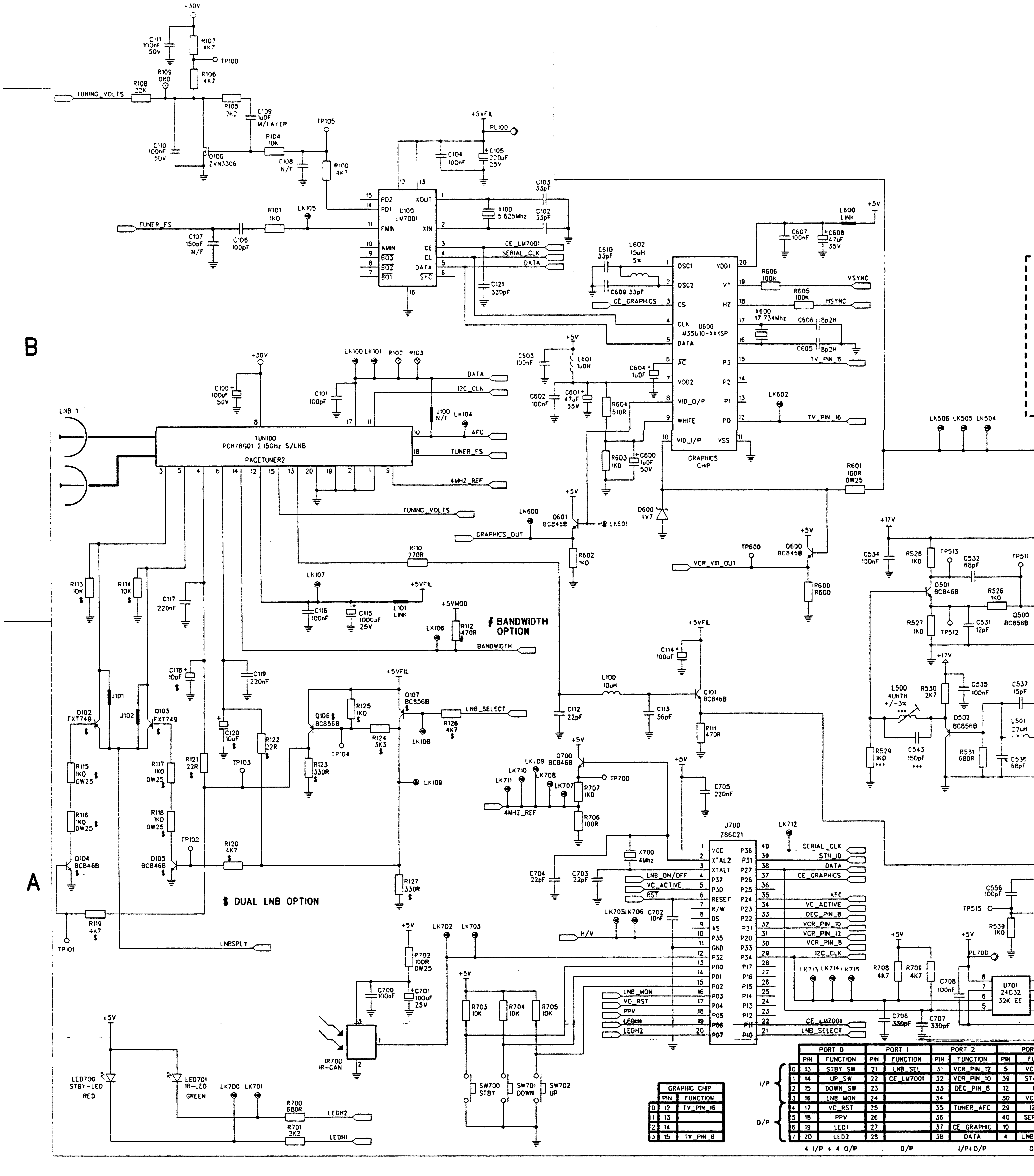
R124	E2 †
R125	E2 †
R126	F4 †
R127	E2 †
R200	C2 †
R201	C2 †
R202	C2 †
R203	D2 †
R204	D2 †
R205	D3 †
R206	D3 †
R207	D3 †
R208	C3 †
R210	B3 †
R211	C3 †
R212	B2 †
R213	C2 †
R214	C2 †
R215	C2 †
R216	B3 †
R217	B2 †
R218	B3 †
R219	B2 †
R220	B3 †
R300	G4 †
R301	G6 †
R302	G6 †
R303	G6 †
R304	G6 †
R305	G6 †
R306	G6 †
R307	H5 †
R308	H5 †
R309	G6 †
R310	H7 †
R311	G6 †
R312	G4 †
R313	G4 †
R314	G4 †
R315	G4 †
R316	G5 †
R317	G4 †
R318	G4 †
R319	G4 †
R320	G4 †
R321	G4 †
R322	G4 †
R323	G3 †
R324	G3 †
R325	G3 †
R326	G3 †
R327	G3 †
R328	G4 †
R329	G4 †
R330	G4 †
R331	F4 †
R332	F4
R333	E4 †
R334	H5 †
R335	H5 †
R336	I7 †
R337	I7 †
R338	H6 †
R339	I7 †
R340	H6 †
R341	I8 †
R342	I7 †
R343	I8 †
R344	I8 †
R345	I8 †
R346	I8 †
R347	F7 †
R348	J8 †
R349	J9 †
R350	J8 †
R351	J7 †
R352	I8 †
R353	J7 †
R354	J4 †
R512	E5 †
R513	E5 †
R514	E4 †
R515	E5 †
R516	E4 †
R517	E4 †
R518	E4 †
R519	E4 †
R520	E4 †
R521	D4 †
R522	E4 †
R523	E4 †
R524	E4 †
R525	C5 †
R526	D5 †
R527	C5 †
R528	C5 †
R529	C5 †
R530	C5 †
R531	C5 †
R532	D5 †
R533	E5 †
R534	E5 †
R535	D5 †
R536	D6 †
R537	E5 †
R538	E6 †
R539	E6 †
R540	E6 †
R541	E6 †
R542	D4 †
R543	E4 †
R600	D8 †
R601	D8
R602	B7 †
R603	C8 †
R604	C8 †
R605	C9 †
R606	C9 †
R607	B8 †
R608	B7 †
R609	B7 †
R610	B9 †
R611	B8 †
R612	B9
R613	B9
R614	B8 †
R615	B8 †
R616	B7 †
R617	C4 †
R618	C5 †
R619	B7 †
R620	D8 †
R621	D7 †
R622	B4 †
R623	D8 †
R624	D7 †
R625	E7 †
R626	D8 †
R627	D8 †
R628	D8 †
R629	D8 †
R630	C5 †
R631	D5 †
R632	C5
R633	H7 †
R634	H7 †
R635	H7 †
R636	H8 †
R637	H8 †
R638	H7 †
R639	H8 †
R640	I8 †
R641	H8 †
R642	I8 †
R700	J7 †
R701	J7 †
R702	J8
R703	J9 †
C121	F3 †
C200	D2
C201	C2 †
C202	C2 †
C203	C2 †
C204	D3 †
C205	C2 †
C206	C3 †
C207	D3 †
C208	D3 †
C209	C3 †
C210	C3 †
C211	C2 †
C212	C2 †
C213	C2 †
C214	C2 †
C215	C2 †
C216	C2 †
C217	C2 †
C218	B3 †
C219	C3 †
C220	B3
C221	B2 †
C222	B3 †
C223	B3 †
C224	B3 †
C225	B2 †
C226	C3 †
C227	B2 †
C300	G5 †
C301	G6 †
C302	G5 †
C303	G5 †
C304	G6 †
C305	G6 †
C306	H6 †
C307	G5
C308	H6 †
C309	H6 †
C310	H6 †
C311	H6 †
C312	H6 †
C313	H6 †
C314	G4 †
C315	G4 †
C316	G4 †
C317	G5 †
C318	G3 †
C319	G4 †
C320	F4 †
C321	E4 †
C322	E4 †
C323	I7
C324	I7 †
C325	I2
C326	J4
C327	J4 †
C328	I7 †
C329	I8
C330	H6 †
C331	I8 †
C332	I8 †
C333	I8 †
C334	I8 †
C335	J8 †
C336	I9
C337	J8 †
C338	J9 †
C339	J8
C340	J8 †
C341	J8
C342	J4 †
C343	H3 †
C344	J2 †
C345	I6 †
C346	H6 †
C347	H5 †
C348	J4 †
C349	H5 †
C606	B9 †
C607	C9 †
C608	C9
C609	C9 †
C610	C9 †
C611	B8
C612	C4 †
C613	B4 †
C614	D8 †
C615	H7 †
C616	H7 †
C617	H7 †
C618	I8 †
C700	K8 †
C701	J8
C702	F7 †
C703	F7 †
C704	F8 †
C705	F8 †
C706	D7 †
C707	D7 †
C708	D7 †
TRANSISTORS	
Q1	G8
Q2	E8
Q3	E8 †
Q4	G6 †
Q5	G8 †
Q6	G8 †
Q7	G7 †
Q8	F7 †
Q9	H8 †
Q100	F3 †
Q101	C4 †
Q102	E2
Q103	E2
Q104	E2 †
Q105	E3 †
Q106	E2 †
Q107	E2 †
Q200	C3 †
Q300	G5 †
Q301	G6 †
Q302	G4 †
Q303	G4 †
Q304	G4 †
Q305	G4 †
Q306	G4 †
Q307	G3 †
Q308	G3 †
Q309	G3 †
Q310	E4 †
Q311	I7 †
Q312	I8 †
Q313	F7 †
Q314	H3 †
Q315	I3
Q500	D5 †
Q501	D5 †
Q502	C5 †
Q600	C8 †
Q601	B8 †
Q602	B7 †
Q603	B7 †
Q604	B9 †
Q605	C5
Q606	H7 †
Q607	H7 †
Q608	H8 †
Q609	I8 †
Q700	F8 †
ICs	
U1	F11
U2	G8
U3	J9
U100	E2
U200	C2 †
U201	B2 †
U300	H6
L305	H6
L306	H6
L500	C5
L501	C5
L502	D6
L503	D6
L600	B9
L601	D8
L602	C9
CONNECTORS	
SK1	B10
SK600	B8
SK601	B5
PL100	E3
PL601	B7
PL700	E8
LINKS	
J1	G8
J100	C4
J101	E2
J102	E2
J300	J4
J301	J3
J302	J4
J303	J4
J600	B8
J601	B8
J602	H8
LK1	B10
LK2	C11
LK3	H9
LK4	G7
LK5	E2
LK6	G7
LK7	G5
LK100	C3
LK101	F5
LK105	E3
LK106	C3
LK107	D3
LK108	E3
LK109	E3
LK200	D3
LK201	E3
LK202	B2
LK203	C3
LK204	B3
LK300	I4
LK301	I4
LK302	G6
LK303	G6
LK304	G7
LK305	D4
LK306	F5
LK307	J3
LK308	J3
LK309	I7
LK310	I6
LK311	H8
LK312	I4
LK313	J4
LK314	J3
LK315	H7
LK316	H7
LK317	I8
LK318	J6
LK319	I6
LK320	I6
LK321	J6
LK322	J6
LK323	I6
LK324	J6
LK325	J6
LK326	I5
LK327	I4
LK328	K5
LK329	I6
LK330	J6
LK331	K4
LK824	F5
LK825	H5
LK826	K5
LK827	C5
LK828	F5
LK829	J7
LK830	J6
LK831	H5
LK832	H5
LK833	G5
LK834	I5
LK835	K5
LK836	J3
LK837	J3
LK838	J10
LK839	C8
LK840	D8
LK841	E8
LK842	K7
LK843	E7
LK844	G3
LK845	H7
LK846	F8
LK847	E6
LK848	I7
LK849	J9
LK850	I9
LK851	C2
LK852	E3
LK853	D3
LK854	E3
LK855	F3
LK856	H9
LK857	K8
LK858	J10
LK859	I9
LK860	C6
LK861	D7
LK862	E8
LK863	J10
MISC COMPONENTS	
CRD300	G4
FS1	C10
HS1	E8
HS2	E9
IR700	K6
LED700	K7
LED701	K6
MOD1	B3
SW700	J10
SW701	J9
SW702	K8
T1	D11
T2	F10
TF1	J2
TF2	I10
TST300	K7
TUN100	C4
VDR1	C11
X100	F2
X300	I6
X301	I8
X600	C9
X700	F8



Main Board Circuit Diagram

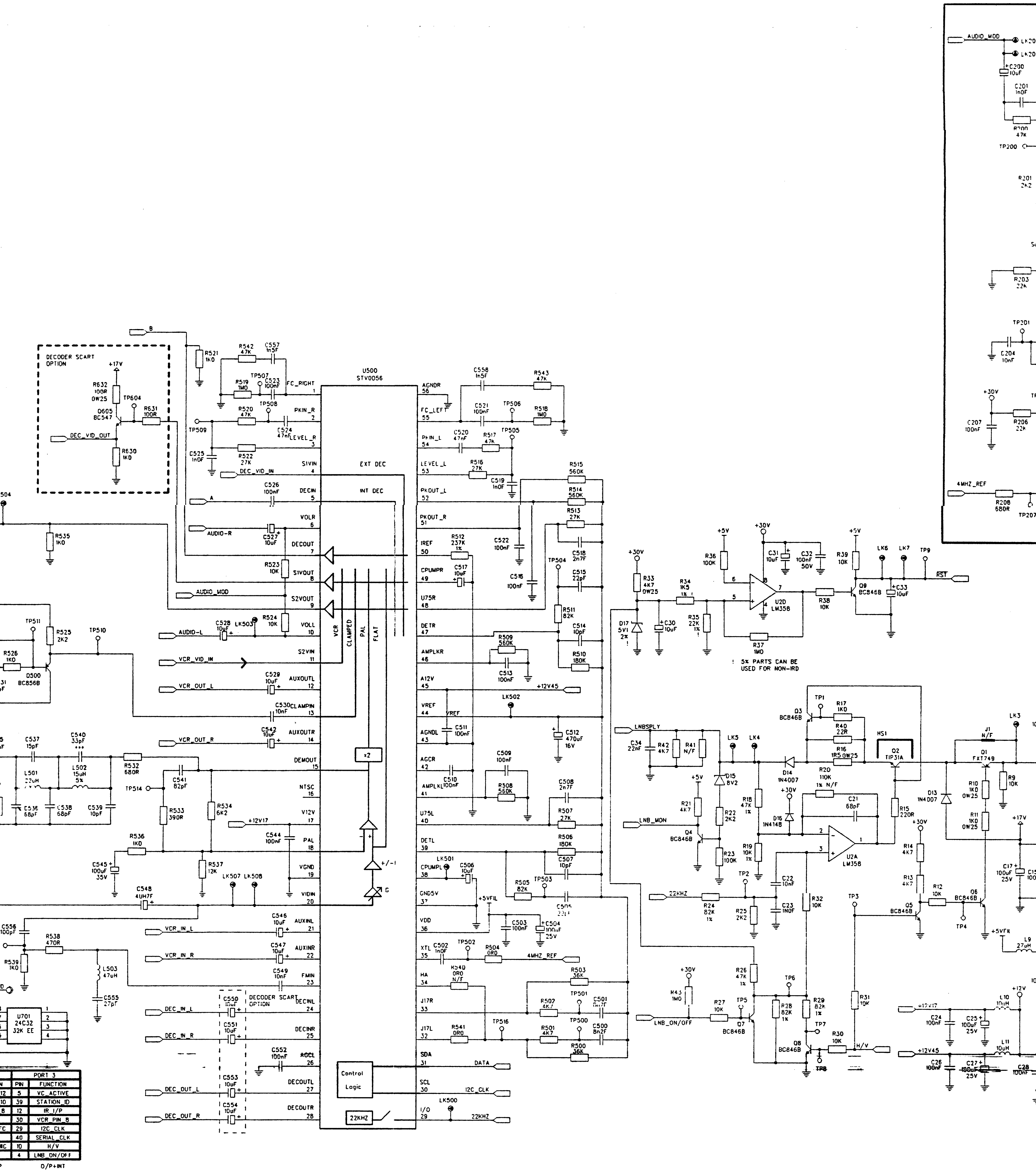

6
5
4
D
C
VCR
SK601-1
SK601-2
SK601-3
SK601-6
SK601-8
SK601-10
SK601-12
SK601-19
SK601-20
LK620
LK619
LK618
LK617
LK615
LK616
LK614
VCR_OUT_R
VCR_IN_R
VCR_OUT_L
VCR_IN_L
R627 1K0
VCR_PIN_8
R629 1K0
VCR_PIN_10
R628 2K2
C614 100pF
D606 4V7
D605 4V7
R626 22K
+5V
R625 4K7
R624 470R
VCR_PIN_12
R623 75R
VCR_VID_OUT
D604 4V7
C613 100nF
VCR_VID_IN
R622 75R
LK611 LK612 LK613
SK601-25
SK601-26
SK601-30
SK601-34
SK601-35
SK601-38
SK601-39
SK601-42
SK600-4
SK600-5
SK600-9
SK600-13
SK600-14
SK600-17
SK600-18
SK600-21
SK601-4
SK601-5
SK601-9
SK601-13
SK601-14
SK601-17
SK601-18
SK601-21
DEC
SK601-22
SK601-23
SK601-24
SK601-27
SK601-28
SK601-29
SK601-32
SK601-33
SK601-36
SK601-37
SK601-40
SK601-41
DEC_OUT_R
DEC_IN_R
DEC_OUT_L
DEC_IN_L
B
G
R
R621 1K0
DECODER SCART OPTION
DEC_PIN_8
LK607 LK608
LK609
LK610
R619 1K0
DEC_PIN_16
D602 4V7
D603 4V7
R620 22K
R618 75R
DEC_VID_OUT
DEC_VID_IN
R617 75R
LK606
C612 100nF
PHONO AUDIO
PL601-3
PL601-2
PL601-1
J601
J600 N/F
R616 75R
C611 10uF N/F
LK605
R615 6K2 N/F
R614 6K2 N/F
AUDIO-L
AUDIO-R
LK604
TV
SK600-1
SK600-3
SK600-7
SK600-8
SK600-11
SK600-15
SK600-16
SK600-19
LK603
R613 470R 0W25
+17V
R612 470R 0W25
TP603
R610 10K
TV_PIN_8
D601 12V
Q604 BC846B
R611 75R
GRAPHICS_OUT
R609 75R
Q603 BC846B
DEC_PIN_16
R608 470R
TP602
Q602 BC846B
R607 10K
TV_PIN_16
TP601
NON-IRD OPTION
TP607
R633 1K0
C615 330pF
Q606 BC846B
TP605
C616 220nF
TP606
R634 1K0
R635 56K
C617 100nF
Q607 BC856B
R636 2K2
TP608
R637 100K
R638 47K
R639 470R
J602
STN_ID
HSYNC
Q608 BC846B
TP609
C618 1n0F
R640 100K
R641 100K
TP610
R642 22K
VSYNC
Q609 BC846B
+30V


LK800
LK801
LK802
LK803
LK804
LK805
LK806
LK807
LK808
LK809 N/F
LK810
LK811
LK812
LK813
LK814
LK815
LK816
LK817
LK818
LK819
LK820
LK821
LK822
LK823
LK824
LK825
LK826
LK827
R800
R801
R802
R803
R804
R805
R806
R807
R808
R809
TP800
TP801
+12V
LK828
LK829
LK830
LK831
LK832
LK833
TP802
+5V
LK834
LK835
LK836
LK837
R810
R811
+5V
LK838
LK839
LK840
LK841
LK842
LK843
LK844
LK845
LK846
LK847
LK848
LK849
LK850
+5VFIL
LK851
LK852
R812
+30V
LK853
LK854
LK855
LK856
LK857
LK858
LK859
+17V
LK860
LK861
LK862
LK863


B
A
+30V
C111 100nF 50V
R107 4K7
TP100
R106 4K7
R109 0R0
R108 22K
TUNING_VOLTS
R105 2K2
C109 1uOF M/LAYER
C110 100nF 50V
Q100 ZVN3306
R104 10K
C108 N/F
TP105
R100 4K7
+5VFIL
PL100
C104 100nF
C105 220uF 25V
C103 33pF
X100 5.625Mhz
C102 33pF
U100 LM7001
PD2
PD1
XOUT
FMIN
XIN
AMIN
BO3
BO2
BO1
CE
CL
DATA
STC
R101 1K0
LK105
TUNER_FS
C107 150pF N/F
C106 100pF
CE_LM7001
SERIAL_CLK
DATA
C121 330pF
L600 LINK
+5V
C607 100nF
C608 47uF 35V
C610 33pF
L602 15uH 5%
C609 33pF
CE_GRAPHICS
U600 M35010-XXXSP
OSC1
OSC2
CS
CLK
DATA
AC
VDD2
VID_O/P
WHITE
VID_I/P
VDD1
VT
HZ
P3
P2
P1
P0
VSS
R606 100K
VSYNC
R605 100K
HSYNC
X600 17.734Mhz
C606 8p2H
C605 8p2H
TV_PIN_8
TV_PIN_16
GRAPHICS CHIP
C603 100nF
L601 1uOH
C604 1uOF
C602 100nF
C601 47uF 35V
R604 510R
R603 1K0
C600 1uOF 50V
LK602
R601 100R 0W25
D600 1V7
LK600
Q601 BC845B
LK601
GRAPHICS_OUT
R602 1K0
TP600
Q600 BC846B
VCR_VID_OUT
R600 R600
LK100 LK101 R102 R103
DATA
I2C_CLK
C101 100pF
J100 N/F
LK104
AFC
TUNER_FS
4MHZ_REF
TUNING_VOLTS
C100 100uF 50V
LNB 1
TUN100 PCH78G01 2.15GHz S/LNB PACETUNER2
R113 10K
R114 10K
C117 220nF
R110 270R
LK107
+5VFIL
C116 100nF
C115 1000uF 25V
L101 LINK
+5VMOD
R112 470R
LK106
# BANDWIDTH OPTION
BANDWIDTH
C118 10uF
C119 220nF
J101
J102
Q102 FXT749
Q103 FXT749
C120 10uF
R125 1K0
Q106 BC856B
Q107 BC856B
LNB_SELECT
R126 4K7
LK108
R124 3K3
TP104
R122 22R
R121 22R
TP103
R123 330R
LK109
R115 1K0 0W25
R117 1K0 0W25
R116 1K0 0W25
R118 1K0 0W25
Q104 BC846B
Q105 BC846B
TP102
R120 4K7
R127 330R
$ DUAL LNB OPTION
R119 4K7
TP101
LNBSPLY
C114 100uF
Q101 BC846B
L100 10uH
C112 22pF
C113 56pF
R111 470R
Q700 BC846B
LK709 LK710 LK708 LK711 LK707
TP700
4MHZ_REF
R707 1K0
R706 100R
C705 220nF
X700 4Mhz
C704 22pF
C703 22pF
U700 Z86C21
LK712
SERIAL_CLK
STN_ID
DATA
CE_GRAPHICS
LNB_ON/OFF
VC_ACTIVE
RST
AFC
VC_ACTIVE
DEC_PIN_8
VCR_PIN_10
VCR_PIN_12
VCR_PIN_8
I2C_CLK
LK705 LK706
C702 10nF
H/V
LK702 LK703
R702 100R 0W25
C700 100nF
C701 100uF 25V
IR700 IR-CAN
R703 10K
R704 10K
R705 10K
LNB_MON
VC_RST
PPV
LEDH1
LEDH2
CE_LM7001
LNB_SELECT
LK713 LK714 LK715
R708 4K7
R709 4K7
C706 330pF
C707 330pF
C708 100nF
PL700
U701 24C32 32K EE
SW700 STBY
SW701 DOWN
SW702 UP
LED700 STBY-LED RED
LED701 IR-LED GREEN
LK700 LK701
R700 680R
R701 2K2
LEDH2
LEDH1
LK506 LK505 LK504
+17V
C534 100nF
R528 1K0
TP513
C532 68pF
TP511
Q501 BC846B
R526 1K0
Q500 BC856B
R527 1K0
TP512
C531 12pF
C535 100nF
L500 4UH7H +/-3%
R530 2K7
C537 15pF
Q502 BC856B
L501 22uH
R529 1K0
C543 150pF
R531 680R
C536 68pF
C556 100pF
TP515
R539 1K0

	GRAPHIC CHIP	
	PIN	FUNCTION
0	12	TV PIN 16
1	13	
2	14	
3	15	TV PIN 8

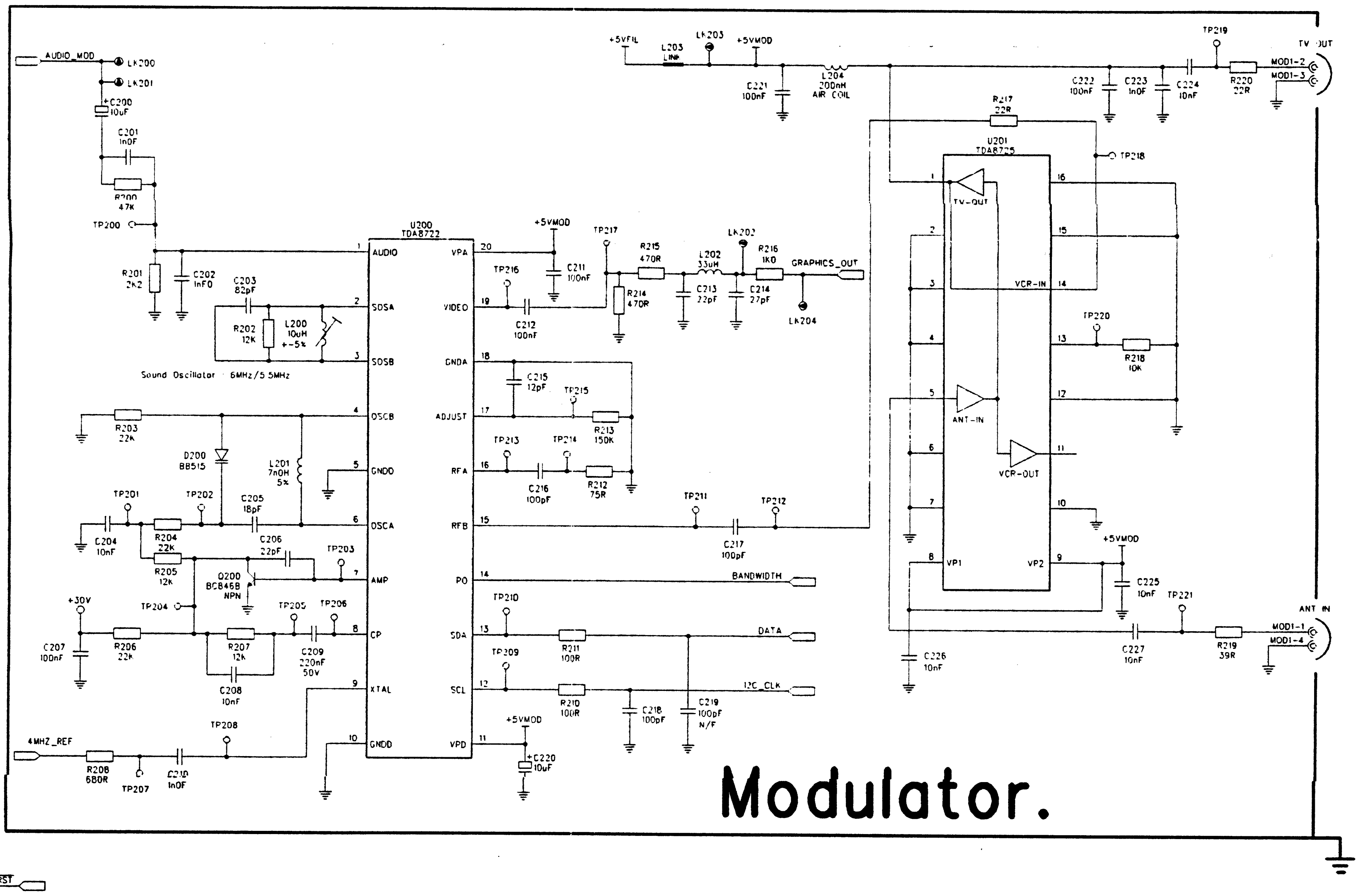
		PORT 0		PORT 1		PORT 2		POR
		PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN
I/P	0	13	STBY SW	21	LNB_SEL	31	VCR_PIN_12	5
	1	14	UP_SW	22	CE_LM7001	32	VCR_PIN_10	39
	2	15	DOWN_SW	23		33	DEC_PIN_8	12
	3	16	LNB_MON	24		34		30
O/P	4	17	VC_RST	25		35	TUNER_AFC	29
	5	18	PPV	26		36		40
	6	19	LED1	27		37	CE_GRAPHIC	10
	7	20	LED2	28		38	DATA	4
		4 I/P + 4 O/P		O/P		I/P+O/P		O

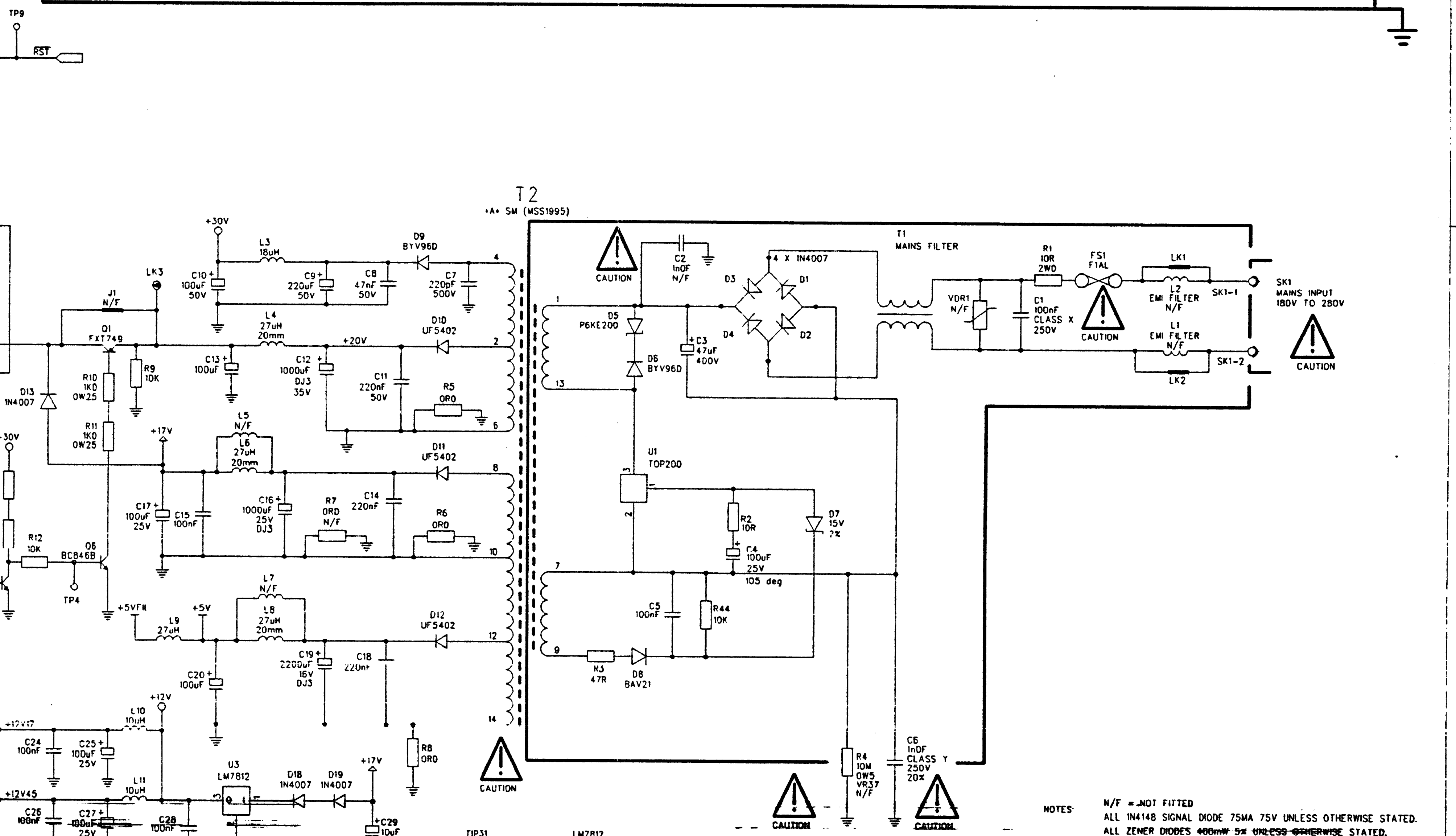

U500
STV0056
EXT DEC
INT DEC
Control
Logic
22KHZ
x2
VCR
CLAMPED
PAL
FLAT
DECODER SCART OPTION
+17V
R632 100R 0W25
TP604
D605 BC547
R631 100R
DEC_VID_OUT
R630 1K0
B
A
R521 1K0
R542 47K
C557 1n5F
R519 1M0
TP507
C523 100nF
FC_RIGHT 1
R520 47K
TP508
PKIN_R 2
TP509
C524 47nF
LEVEL_R 3
C525 1n0F
R522 27K
S1VIN 4
DEC_VID_IN
C526 100nF
DECIN 5
AUDIO-R
C527 10uF
VOLR 6
DECOUT 7
R523 10K
S1VOUT 8
AUDIO_MOD
S2VOUT 9
R524 10K
C528 10uF
LK503
AUDIO-L
VOLL 10
S2VIN 11
VCR_VID_IN
C529 10uF
AUXOUTL 12
VCR_OUT_L
C530 10nF
CLAMPIN 13
C542 10uF
AUXOUTR 14
VCR_OUT_R
DEMOUT 15
NTSC 16
+12V17
V12V 17
PAL 18
VGND 19
VIDIN 20
C546 10uF
AUXINL 21
VCR_IN_L
C547 10uF
AUXINR 22
VCR_IN_R
C549 10nF
FMIN 23
C550 10uF
DECINL 24
DEC_IN_L
C551 10uF
DECINR 25
DEC_IN_R
C552 100nF
AGCL 26
C553 10uF
DECOUTL 27
DEC_OUT_L
C554 10uF
DECOUTR 28
DEC_OUT_R
R535 1K0
TP511
R525 2K2
TP510
R526 1K0
D500 BC856B
C537 15pF
C540 33pF
L501 22uH
L502 15uH 5%
C536 68pF
C538 68pF
C539 10pF
R532 680R
C541 82pF
TP514
R533 390R
R534 6K2
C544 100nF
R536 1K0
R537 12K
C545 100uF 35V
C548 4UH7F
LK507 LK508
C556 100pF
R538 470R
R539 1K0
L503 47uH
C555 27pF
U701
24C32
32K EE
AGNDR 56
C558 1n5F
R543 47K
FC_LEFT 55
C521 100nF
TP506
R518 1M0
PKIN_L 54
C520 47nF
R517 47K
TP505
LEVEL_L 53
R516 27K
C519 1n0F
PKOUT_L 52
R515 560K
R514 560K
PKOUT_R 51
R513 27K
IREF 50
R512 237K 1%
C522 100nF
C518 2n7F
CPUMPR 49
C517 10uF
C516 100nF
TP504
C515 22pF
U75R 48
R511 82K
DETR 47
C514 10pF
R509 560K
AMPLKR 46
R510 180K
C513 100nF
A12V 45
+12V45
VREF 44
LK502
AGNDL 43
C511 100nF
C512 470uF 16V
AGCR 42
C509 100nF
AMPLKL 41
C510 100nF
R508 560K
C508 2n7F
U75L 40
R507 27K
DETL 39
R506 180K
C507 10pF
LK501
CPUMPL 38
C506 10uF
R505 82K
TP503
GND5V 37
+5VFIL
C505 22pF
VDD 36
C503 100nF
C504 100uF 25V
XTL 35
C502 1n0F
TP502
R504 0R0
4MHZ_REF
HA 34
R540 0R0 N/F
R503 36K
J17R 33
R502 4K7
TP501
C501 8n2F
TP516
TP500
J17L 32
R541 0R0
R501 4K7
C500 8n2F
R500 36K
SDA 31
DATA
SCL 30
I2C_CLK
I/O 29
LK500
22KHZ
+30V
R33 4K7 0W25
D17 5V1 2%
C30 10uF
R34 1K5 1%
R35 22K 1%
+5V
R36 100K
C31 10uF
C32 100nF 50V
U2D LM358
R37 1M0
R38 10K
R39 10K
Q9 BC846B
LK6 LK7 TP9
C33 10uF
RST
! 5% PARTS CAN BE USED FOR NON-IRD
LNBSPLY
C34 22nF
R42 4K7
R41 N/F
D15 8V2
LK5 LK4
D3 BC846B
TP1
R17 1K0
R40 22R
R16 1R5 0W25
HS1
Q2 TIP31A
D14 1N4007
R20 110K 1% N/F
C21 68pF
R21 4K7
R22 2K2
R18 47K 1%
D16 1N4148
LNB_MON
Q4 BC846B
R23 100K
R19 10K 1%
U2A LM358
R15 220R
D13 1N4007
TP2
C22 10nF
22KHZ
R24 82K 1%
R25 2K2
C23 1N0F
R32 10K
TP3
Q5 BC846B
R14 4K7
R13 4K7
R12 10K
Q6 BC846B
TP4
R43 1M0
R27 10K
TP5
D7 BC846B
LNB_ON/OFF
R26 47K 1%
TP6
R28 82K 1%
R29 82K 1%
TP7
Q8 BC846B
R30 10K
H/V
TP8
R31 10K
LK3
J1 N/F
Q1 FXT749
R9 10K
R10 1K0 0W25
R11 1K0 0W25
C17 100uF 25V
+5VFIL
L9 27uH
L10 10uH
+12V17
C24 100nF
C25 100uF 25V
L11 10uH
+12V45
C26 100nF
C27 100uF 25V
C28 100nF
AUDIO_MOD
LK20
C200 10uF
C201 1n0F
R200 47K
TP200
R201 2K2
R203 22K
TP201
C204 10nF
+30V
C207 100nF
R206 22K
4MHZ_REF
R208 680R
TP207

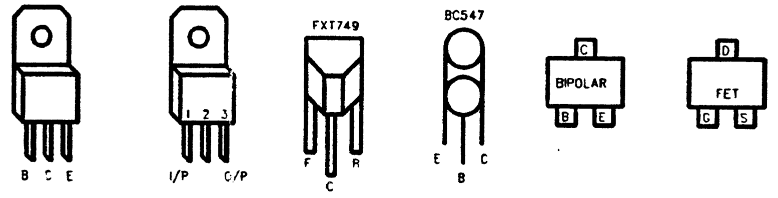
	PORT 3	
N	PIN	FUNCTION
12	5	VC_ACTIVE
10	39	STATION_ID
8	12	IR_I/P
	30	VCR_PIN_8
FC	29	I2C_CLK
	40	SERIAL_CLK
IC	10	H/V
	4	LNB_ON/OFF

O/P+INT

Modulator.


AUDIO_MOD
LK200
LK201
C200 10uF
C201 1nOF
R200 47K
TP200
R201 2K2
C202 1nF0
C203 82pF
R202 12K
L200 10uH +-5%
Sound Oscillator 6MHz/5.5MHz
U200 TDA8722
AUDIO
SOSA
SOSB
OSCB
GNDO
OSCA
AMP
CP
XTAL
GNDD
VPA
VIDEO
GNDA
ADJUST
RFA
RFB
PO
SDA
SCL
VPD
R203 22K
D200 BB515
L201 7nOH 5%
TP201
TP202
C205 18pF
C204 10nF
R204 22K
R205 12K
C206 22pF
TP203
Q200 BC846B NPN
+30V
TP204
TP205
TP206
C207 100nF
R206 22K
R207 12K
C209 220nF 50V
C208 10nF
TP208
4MHZ_REF
R208 680R
TP207
C210 1nOF
+5VMOD
C211 100nF
TP216
C212 100nF
TP217
R215 470R
R214 470R
L202 33uH
C213 22pF
LK202
R216 1K0
C214 27pF
GRAPHICS_OUT
LK204
C215 12pF
TP215
R213 150K
TP213
TP214
C216 100pF
R212 75R
TP211
TP212
C217 100pF
BANDWIDTH
TP210
R211 100R
DATA
TP209
R210 100R
C218 100pF
C219 100pF N/F
I2C_CLK
C220 10uF
+5VFIL
L203 LINK
LK203
C221 100nF
L204 200nH AIR COIL
R217 22R
U201 TDA8725
TP218
TV-OUT
VCR-IN
ANT-IN
VCR-OUT
VP1
VP2
TP220
R218 10K
C222 100nF
C223 1nOF
C224 10nF
TP219
R220 22R
TV OUT
MOD1-2
MOD1-3
C225 10nF
TP221
C226 10nF
C227 10nF
R219 39R
ANT IN
MOD1-1
MOD1-4
B


TP9
RST
T2
+A+ SM (MSS1995)
+30V
L3 18uH
D9 BYV96D
C10 100uF 50V
C9 220uF 50V
C8 47nF 50V
C7 220pF 500V
LK3
J1 N/F
D1 FXT749
L4 27uH 20mm
+20V
D10 UF5402
R9 10K
C13 100uF
C12 1000uF DJ3 35V
C11 220nF 50V
R5 0R0
R10 1K0 0W25
D13 1N4007
R11 1K0 0W25
+17V
L5 N/F
L6 27uH 20mm
D11 UF5402
C17 100uF 25V
C15 100nF
C16 1000uF 25V DJ3
R7 0R0 N/F
C14 220nF
R6 0R0
R12 10K
Q6 BC846B
TP4
+5VFIL
L9 27uH
+5V
L7 N/F
L8 27uH 20mm
D12 UF5402
C19 2200uF 16V DJ3
C18 220nF
C20 100uF
+12V
+12V17
L10 10uH
C24 100nF
C25 100uF 25V
R8 0R0
+12V45
L11 10uH
U3 LM7812
D18 1N4007
D19 1N4007
+17V
C26 100nF
C27 100nF 25V
C28 100nF
C29 10uF 50V
CAUTION
C2 1nOF N/F
4 x 1N4007
D3
D1
D4
D2
T1 MAINS FILTER
R1 10R 2W0
FS1 F1AL
LK1
D5 P6KE200
D6 BYV96D
C3 47uF 400V
VDR1 N/F
C1 100nF CLASS X 250V
L2 EMI FILTER N/F
L1 EMI FILTER N/F
LK2
SK1-1
SK1-2
SK1 MAINS INPUT 180V TO 280V
U1 TOP200
R2 10R
C4 100uF 25V 105 deg
D7 15V 2%
C5 100nF
R44 10K
R3 47R
D8 BAV21
R4 10M 0W5 VR37 N/F
C6 1nOF CLASS Y 250V 20%
A


TIP31
B C E
LM7812
1 2 3
I/P O/P
FXT749
F R C
BC547
E B C
C
BIPOLAR
B E
D
FET
G S

NOTES:

N/F = NOT FITTED
ALL 1N4148 SIGNAL DIODE 75MA 75V UNLESS OTHERWISE STATED.
ALL ZENER DIODES ~~400mW 5% UNLESS OTHERWISE~~ STATED.
ALL ELECTROLYTICS 50V UNLESS OTHERWISE STATED.
ALL 100nF CAPS 25V 20/80% UNLESS OTHERWISE STATED.
ALL RESISTORS 0.1W 5% UNLESS OTHERWISE STATED.
ALL CAPACITORS 50V 5% UNLESS OTHERWISE STATED.
ALL INDUCTORS 10% UNLESS OTHERIWSE STATED.
● = WIRE LINK IN THE NET
⊗ = ZERO OHM RESISTOR IN THE NET.
○ = TEST PAD IN THE NET.